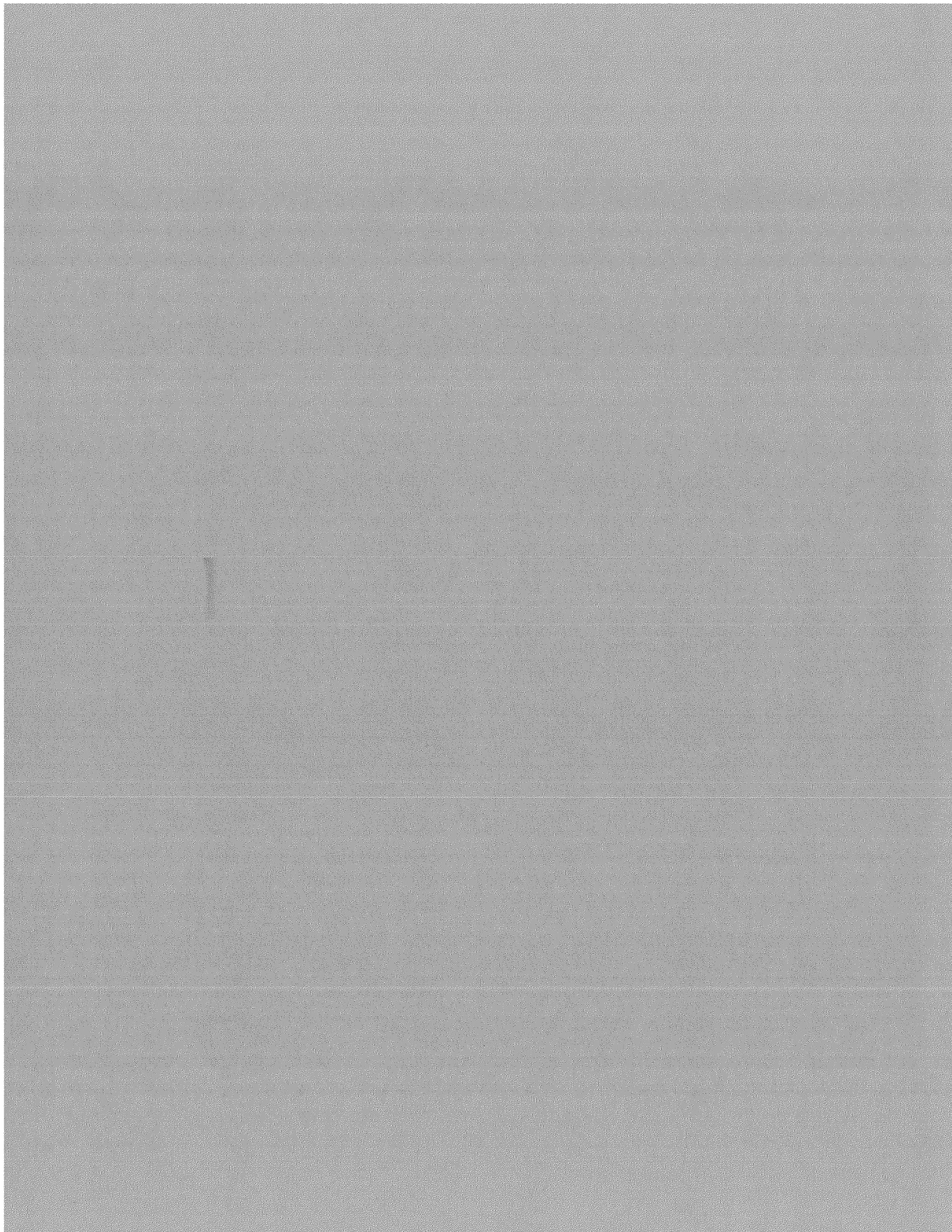


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SM-122C Reflection Amplifier - Initial Test

1. Use separate supplies for $\pm 36V$; connect Variac on AC input to $\pm 48V$ supplies.
2. Turn on $\pm 36V$ only. Check for $+15V$ and $-15V$ at pins 7 and 4 respectively of IC 1.
3. Preset pots LIN 1A, LIN 2A, LIN 3A to max. CCW; LIN 1, LIN 2, LIN 3 to approx. mid-range.
4. Feed 20 KHZ triangle wave into input. Ground other input with 75Ω . Signal at terminal T9 should be $\pm 10V$ triangle with $\pm 2V$ at input. Adjust OFFSET pot to center swing at T9. The T9 signal should be inverted with respect to the input.
5. Increasing input should cause T9 signal to limit at ± 10 to 11 volts.
6. Reduce input to zero.
7. Repeat steps 2 through 6 for other ^{axis} amplifier.
8. Clip current probe on yoke wire. ^{With $\pm 36V$ on,} slowly increase variac while watching ~~yoke~~ current for excessive yoke current. Stop at about $\pm 10V$ at $48V$ inputs initially.

9. Increase triangle wave input and check ^{for} yoke current waveform. DC voltages at test points should be approximately as follows; T1 and 3: +6V;
T2 and 4: +3V; T5 and 7: -3V; T6 and 8: -6V

10. Repeat steps 8 and 9 ^{for} other axis amplifier.

11. Increase variac to full line voltage. With $\pm 3V$ 20 KHZ triangle wave at input, yoke current should swing $\pm 3A$. Limiting should occur at approx. $\pm 3.5A$. DC voltages at test points should ^{be} as follows:
T1 and 3: +34V; T2 and 4: +18V; T5 and 7: -18V;
T6 and 8: -34V.

12. With 20 KHZ square wave at input and amplitude to give $\pm 2A$ of yoke current, adjust trimmer caps C10 for minimum settling time of yoke voltage at Terminal E.

13. Check quiescent output current as follows:
Ground input with 75 Ω and ^{adjust} voltage at terminal E to be zero using OFFSET pot. Voltages at terminals A and B should be +0.6 to 0.7V;
terminals C and D should be -0.6 to 0.7V.

14. Repeat steps 11 through 13 for other axis amplifier.

SCANIMATE II

Pots on cards are referred to numbered from back to front

Card #2 Horizontal animation oscillator

Pot #1 (R3) sets positive and negative slope symmetry

2 (R2) sets negative peak voltage

3 (R1) sets positive peak voltage

Card #3 Vertical animation oscillator

Pot #1 (R3) sets positive and negative slope symmetry

2 (R2) sets negative peak voltage

3 (R1) sets positive peak voltage

Card #4 Depth animation oscillator

Pot #1 (R3) sets positive and negative slope symmetry

2 (R2) sets negative peak voltage

3 (R1) sets positive peak voltage

Card #5 Animation adder and differentiator

Pot #1 sets Y multiplier zero

2 Sets Y multiplier DC offset

3 Sets Y_s gain

4 Sets Y_s DC offset

5 Sets X_s gain

6 Sets X_s DC offset

7 Sets X multiplier zero

8 Sets X multiplier DC offset

Card #6 Z channel

- Pot #1 (R58) sets depth oscillator multiplier zero point
2 (R118) sets depth oscillator multiplier DC offset
3 (R119) sets min-max sequence
4 (R42) sets max-min sequence
5 (R90) sets Z animation multiplier zero point
6 (R120) sets Z animation multiplier DC offset
7 (R121) controls electronic oscillator switch

Card #10 Ramp generator

- Pot #1 (R48) sets horizontal axis multiplier zero point
2 (R47) sets horizontal size multiplier zero point
3 (R64) sets horizontal size and axis multiplier DC offset
4 (R33) Sets vertical size and axis multiplier DC offset
5 (R15) Sets vertical size multiplier zero point
6 (R16) Sets vertical axis multiplier zero point

Card #11 Signal rotation (with rotation system)

- Pot #1 (R20) Sets vertical sine multiplier zero
2 (R22) Sets sine vertical multiplier zero
3 (R45) Sets vertical cosine multiplier zero
4 (R41) Sets cosine vertical multiplier zero
5 (R60) Sets vertical cosine multiplier DC offset
6 (R35) Sets vertical sine multiplier DC offset
7 (R105) Sets horizontal sine multiplier DC offset
8 (R94) Sets horizontal sine multiplier zero
9 (R91) Sets sine horizontal multiplier zero
10 (R89) Sets horizontal cosine multiplier DC offset
11 (R73) Sets horizontal cosine multiplier zero
12 (R69) Sets cosine horizontal multiplier zero

Card #12 Vertical channel

- Pot #1 (R10) sets depth multiplier zero point
2 (R9) sets depth multiplier DC offset
3 (R60) sets mode multiplier zero point
4 (R62) sets mode multiplier DC offset
5 (R88) sets sequence multiplier zero point
6 (R90) sets sequence multiplier DC offset

Card #13 Horizontal channel

- Pot #1 (R10) sets depth multiplier zero point
2 (R9) sets depth multiplier DC offset
3 (R60) sets mode multiplier zero point
4 (R62) sets mode multiplier DC offset
5 (R88) sets sequence multiplier zero point
6 (R90) sets sequence multiplier DC offset

Card #15 Sync section

- Pot #1 (R35) sets position of shutter bar in frame
2 (R28) sets position of scan converter bar in frame
3 (R26) sets position of scan converter bar in frame

Card #17 Intensity section

- Pot #1 (R7) sets top limit point of raster
2 (R8) sets right limit point of raster
3 (R13) sets left limit point of raster
4 (R14) sets bottom limit point of raster
5 (R4) sets width of horizontal blanking pulse
6 (R1) sets width of vertical blanking pulse

OPERATING INSTRUCTIONS SECTION CONTROL

The Section Control provides a means by which the sections may be set up by dialing the number of horizontal lines desired in each section. The front panel thumbwheel switch is set to indicate the number of horizontal lines from vertical reset to the end of each section.

The sections are set up from the top of the artwork to the bottom, Section 1 being at the top.

For normal operation, each section switch must be set larger than the one before. Sections 1 thru 4 are set with the switches. Section 5 will consist of the number of lines remaining before the next vertical reset pulse.

For one section, the first Section Control is set greater than the number of horizontal lines in a vertical interval. This will enable the Section 1 commutators to control the whole raster. If the commutators are to be dis-abled, the first Section Control is simply set to zero. This will give a raster, but it may be controlled only by the main computer controls.

If more than one section but less than five is desired, there are two ways to accomplish this: one way is to set all sections except the last with the section switches. Set the last Section Control greater than the number of lines remaining in the vertical interval. This will provide section widths as set up on the

switches and the last section will consist of whatever is left. Another way is to set the last section switch less than the previous section. Again, the last section will be whatever is left.

There is one condition that may cause problems and the operator must be aware of this condition. If a Section Control is set the same as the previous section, the display will be controlled by the Section Controls properly set up, but all commutators after and including the one improperly set up, will be dis-abled.

After each section ends, a section blanking pulse is generated which is 2 horizontal lines wide.

The Section Control will set up sections with one horizontal line resolution, with no problems with jitter as before.

ARTWORK PREPARATION

The following descriptions of Kodalith preparation begin with the least complex type--2 levels--and progress to 5 levels (same section). Two level artwork consists of an input of two levels of luminence (usually the black of a Kodalith and its clear area). This artwork is the easiest to prepare and the easiest to set up. The input would consist of a Kodalith of the clients artwork, properly spaced with 1/4" between the bones. As with all set ups the operator would conform the x-y size of the artwork input camera to the aspect ratio of the artwork. This might lower the "1 volt of video". However, when the correct proportions are returned to the display using the computer size controls, the voltage will return close to normal. Any slight variation can then be corrected with a change in aperature. In order to return the artwork display on the crt to normal proportions (assuming that it hasn't been photo-distorted on the Kodalith) take a piece of black paper or film and cut a circle in it. Remove the art from the light box and place the paper with the hole in it on the light box. Using this in combination with the grid, the operator will have no trouble in getting the original proportions back.

3 Luminence Levels

Sections containing 2 colors on a 1 color background

Three levels of luminence are created when there exists on the Kodalith, a black area, a white (clear) area, and a level in between these. The middle grey value, Letrafilm 237, should be used on the artwork for the middle level. This grey scale will give the best separation of values, thereby reducing the chance of noise (interference). When working in excess of 2 levels, the lighter colors should be assigned to the higher levels, the darker colors to the darker levels. This minimizes the fringing effect. The fringing that does result will be dark edges against lighter color, increasing the apparent sharpness. Fringing becomes more noticeable as the number of color levels are increased. It is caused by the finite time of the transition encountered when the scanning beam of the scan converter must go from black to a lighter area. The lighter the area the greater the change. The greater the change the greater the transition time. This manifests itself on the color monitor in terms of the colors of the intermediate levels being displayed along the vertical edges of the graphics.

3 Levels - For involved artwork such as 2 color logo, having 2 colors on the same section on 1 color background.

In order to prepare a 2 color logo, first cut a rubylith mask in register with the black and white positive of the logo.

Position registration marks on the logo and the ruby overlay. Then, have a photoengraver shoot a "composite" first by exposing the mask to the Kodalith film. On this he would register a line shot of the logo bipacked with a 120 line screen that would reproduce the equivalent of the middle (#237) grey in the logo's dark areas. The logo's light areas should be clear and the area surrounding the logo should be black. The procedure for setting up a conformed aspect ratio, as previously mentioned, should be followed.

4 Luminence Levels

Sections containing 3 colors on a 1 color background.

Four levels of luminence are created when there exists on the Kodalith, a black area, a white (clear) area, and two grey levels in between. The light grey value (Letrafilm #173) and the middle grey (Letrafilm #237) are used for the best separation.

4 Levels - 3 color logo and 1 color background.

Four level Kodalith preparation is similar to that for three levels. The difference is that there will be two 120 line screened levels along with the black background and clear area. Show the engraver the artwork first if you are unsure as to which mattes he'll want. Usually a matte of the logo and a matte of the lightest area are sufficient. Using the mattes and logo the engraver can make reverses and combinations of these that will produce what you want. Once again, light colors should be assigned to the light levels, dark colors to the darker levels. The two screened areas should be the equivalent of the lightest grey (#173) and the middle grey (#237).

5 Luminence Levels

Five levels of luminence are created when there exists on the Kodalith, a black area, a white (clear) area and three grey levels. The light grey value (Letrafilm #173), the middle grey (#237) and the dark grey (#177) are used for the best separation.

COLORIZER

Introduction

The purpose of the Colorizer is to produce a color representation using the standard NTSC television format of a static or dynamic scene produced on a CRT controlled by a Scanimate or some other similar device. Each color is independently selective and variable. Signals are generated for representing the scene in discrete shades of gray, which signals are used to generate further signals representing the red, green, and blue components of a color assigned to each gray shade. The system further includes means for selecting the colors assigned to the various gray shades, and exclusive logic means allowing independent selection and variation of each color by an operator.

Level Detector CVS - 103B

Video from the pick-up camera comes into board at Video In. This signal is clamped to ground by Q1 during blanking and fed to the non-inverting input of four comparators (IC1 thru IC4). The second input is the slider pots to adjust the point where each comparator changes state. This card when used in the Gray Level Encoder does not have the gates IC5 and IC7. The output of the comparators go directly to the gray level switches.

Gray Level Switches CVS - 111

The four signals from the level detector go to gates IC1 thru IC3 controlled by four front panel Level Select switches. These switches enable the different gates depending on which switch is active (OV is active). The gates are resistively summed by resistors R1 thru R10 to form the composite encoded video.

Gray Level Encoder Video Amplifier CVS - 112

This board has 3 dual gated video amplifiers that can be switched to A or B input digitally. The inputs of the first amplifier are the encoded video and analog video. The output of this amplifier will be either the encoded video signal or the analog video depending on the logic level at pin 2 of IC1. The second amplifier will invert or not-invert the video signal depending on the position of the Invert-Non-invert switch. The

The adjustments for this card are as follows:

R4 Encoder Gain } { Adjust for 1V P-P at the output of
R7 Analog Gain } { the card or .8V P-P at IC1 (pin 7).

R10 Encoder Level } { Adjust for OV blanking level at
R12 Analog Level } { output of IC1 (pin 7).

R15 Gain Balance Adjust for same gain of Inverted
and Non Inverted signal at the
output of IC2 (pin 7).

R18 Invert Level } { Adjust for a black level of OV
R20 Non Invert Level } { at IC2 (pin 7).

R24 Output Level Adjust for best linearity of
final output.

R26 Blanking Level Adjust for a 5% pedestal ratio
between black level and blanking.



Sync Timing CVS - 102

This card furnishes the timing pulses for X-Y scan converter camera and blanking pulses for the other cards in the color encoder electronics nest. The inputs to this card are the Vertical and Horizontal Drive pulses and composite blanking from the Type 140 NTSC Test Generator. The horiz drive pulse is delayed by $1.5 \mu\text{sec}$ and this pulse goes to two one shots. One one shot forms the horizontal reset pulse for the X-Y camera and the other one shot forms the horizontal portion of the composite clamp. The Vertical drive pulse is delayed $.2 \text{ m}_\text{sec}$ and this pulse also goes to two other one shots. One one shot forms the Vertical Reset pulse and the other forms the vertical portion of the composite clamp waveform. The vertical and horizontal portions of the clamp waveform are combined in an OR circuit to form what is called the Composite Clamp.

The Composite Blanking like the Vertical and Horizontal drive pulses comes from the Type 140 NTSC Test Generator as a 0V to negative voltage waveform. The level of all three are shifted to a 0V to positive voltage so they can be used by the other circuits.

Level Detector CVS - 103B

Video from the scan converter camera comes into the board at the Video Input. This signal is clamped to ground by Q1 during blanking and fed to the non-inverting input of the four comparators (IC1 thru IC4). The inverting input of each comparator connects to a slider pot on the front panel (level adjust pots). These pots adjust the comparison point. As the

video level increases the comparators change state and gate on or off the output levels. Only one output level is on at any one time. The positive level is off and the zero level is on. Composite blanking is used to gate off the first level during blanking. At that time all five output lines are positive.

Also on this board is an amplifier for inverting the correction signal. This inverted signal goes to one side of the level adjust slider pots on the front panel. The output of this amplifier is set at +1V nominal by R16 Corr-Level. The other pot, R15 Corr Gain, adjusts the amount of correction signal to be added to the level adjust controls.

Color Switches CVS - 101B

Coming from the Level Detectors are 5 signal lines. Only one line will be active at any one time. Each of these inputs control the bases of three transistors used for adjusting the amount of color (R, B, G) to be gated to the output. The gain of each transistor is controlled by an external color control slider pot on the front panel. This pot is connected to the emitter of the transistor through a 2.4K resistor. This will give a 1V signal at the output for maximum gain and 0V for minimum gain.

Color Matrix CVS - 100B

This board is added to the Type 140 NTSC Test Generator to convert the R, B, G, video information from the color switches

to Y, R-Y, and B-Y signals. These signals make up the composite video out of the NTSC Test Generator.

Coming into this board are the Red, Green, and Blue signals from the color switches. The signals are clamped and resistively added by R36, R37, and R61 to make up the Y signal. This signal is amplified by Q12 and Q13 differential pair to make the Y and -Y signals. The Y signal is fed to output transistors Q38 and Q39 and goes to the Video Mixer. The -Y signal is added to the red by R62 and R63 to make up R-Y and to the blue by R89 and R90 to make up B-Y. These signals are amplified by differential pairs Q19 and Q20, (R-Y), and Q29 and Q30, (B-Y), to form the $\pm(R-Y)$ and $\pm(B-Y)$ signals which are fed to the current amplifiers (Q21 thru Q24 and Q31 thru Q34).

Coming from the Video Mixer is a modified Y signal which is delayed and fed to an operational amplifier (Q35 thru Q37) which drives the current amplifier (Q15 and Q16).

Blanking is used to gate on and off the current amplifiers (Q15, Q16, Q23, Q24, Q33, Q34) that are the output stages of this card. A switch, S1, can also inhibit Y, R-Y and B-Y signals from being processed by the NTSC Test Generator.

For the following adjustments the Composite Video out of the Type 140 NTSC Test Generator can be observed on a Type 528 waveform monitor. The input test signal should be black and white only:

R38	Y-C Bal	adjust for null at R-Y and B-Y test point of the white level.
R51	Y Gain	adjust for 100% of white level.
R116	Pedestal	adjust for a black level of 0% with pedestal control of video mixer fully ccw. These two controls interact.

The following adjustments can be observed on a Type 520 NTSC Vector Scope. The input test signal should be 5 colors White, Red, Green, Blue, and Black. There will be interaction between the following adjustments. The objective is to get the red and blue vectors in the boxes designated R and B with the origin centered on the vector scope. If these adjustments are properly made the green vector will fall in its designated box:

R64	R-Y Gain	affects length of red vector
R72	R-Y Bal	affects zero position of vector
R70	R-Y Level	affects angle of blue vector. Set at midrange for initial adjustment.
R92	B-Y Gain	affects length of blue vector
R100	B-Y Bal	affects zero position of vector
R98	B-Y Level	affects angle of red vector. Set at midrange for initial adjustment.

Mix - EFF Amplifier VS - 103

~~Not all of this board is used in this application and extra~~
~~pins have been added.~~ Coming in on the A and B inputs are Video

signal from the camera which is delayed at the input to the card and the Y signal from the Color Matrix board (CVS-100B). These two signals are clamped and fed to differential amplifiers Q21 and Q22 that are connected so that they act as mixers. The mix control of the differential amplifiers comes from the dual Transition pot on the front panel. As the transition control is turned CCW the voltage at G1 of Q21 decreases and the voltage at G2 of Q22 increases. Decreasing the gain of the G1 side of Q21 causes the G2 side to conduct more and therefore increase the amount of signal in R66 supplied by the current source Q20. Increasing the gain of the G2 side of Q22 causes the G1 side to conduct less and therefore decrease the amount of signal in R66 supplied by the current source Q23. This mixed signal is clamped by Q27 and coupled to a clipper circuit Q30 which clips the white level to a point set by R92 White Clip. The signal is then amplified and the offset or pedestal added. The offset control R93 is not on the card. The wiper of the Pedestal control on front panel takes the place of the offset wiper. The output goes back to the color matrix board as the new Y signal.

The adjustments on the card are:

R92 White Clip Controls the level at which the
white level is clipped.

R56 A Gain The wiper of this pot goes to
one side of the A pot of the
Transition control. This
adjusts for zero output of
Mixer Q21 when transition control
is fully cw.

R75 B Gain The wiper of this pot goes to
one side of the B pot of the
Transition control. This
adjusts for zero output of
Mixer Q22 when Transition control
is fully CCW.

Scanimate Calibration Procedure for Rotation:

1. Place J11 on an extender.
2. Set the Scanimate horiz. & vert. oscillators to 20 v p-p.
TURN ON BOTH OSC.
3. Place axis locate switch on Scanimate to 'on'.
4. Set section control for one section.
5. Reset rotation (0°)
6. Monitor the output of IC5 with a scope.
7. Adjust sine vertical zero (pot 2) for best null.
8. Monitor the output of IC12 with a scope.
9. Adjust sine horizontal zero (pot 9) for best null.
10. Set rotation (90°)
11. Monitor the output of IC10 with a scope.
12. Adjust cosine horizontal zero (pot 12) for best null.
13. Monitor the output of IC7 with a scope.
14. Adjust cosine vertical zero (pot 4) for best null.
15. Turn off both horizontal and vertical oscillators.
16. Place section 1 in "rotation sequence" mode.
17. Remove the "EOS" cable from the rear of the rotation controller.
18. Start rotation, adjust rotation axis for approximately the center of the raster.
19. Rotation rate pot maximum clockwise.
20. Rotation rate switch in "10x" position.
21. Monitor the output of IC10 with a scope.
22. Trigger the scope on vert reset.
23. Expand the sweep so the axis locate interval is observed.
24. Adjust horizontal cosine zero (pot 11) for best null during axis locate interval.

25. Adjust horizontal cosine offset (pot 10) for zero volts during axis locate interval.
26. Monitor the output of IC12 with a scope.
27. Adjust horizontal sine zero (pot 8) for best null during the axis locate interval.
28. Adjust horizontal sine offset (pot 7) for zero volts during axis locate interval.
29. Monitor output of IC5 with a scope.
30. Adjust vertical sine zero (pot 1) for best null during the axis locate interval.
31. Adjust vertical sine offset (pot 6) for zero volts during axis locate interval.
32. Monitor output of IC7 with a scope.
33. Adjust vertical cosine zero (pot 3) for best null during axis locate interval.
34. Adjust vertical cosine offset (pot 5) for zero volts during the axis locate interval.
35. This concludes the calibration of the rotation ramp generator card.

36. J6 - TURN "ELECT SW" AGAIN

Note: If it is necessary to replace IC 4, 6, 9, 11, an MC1595 must be selected for best null. This is the reason for the sockets in these locations. The better the null, the less axis movement during rotation.

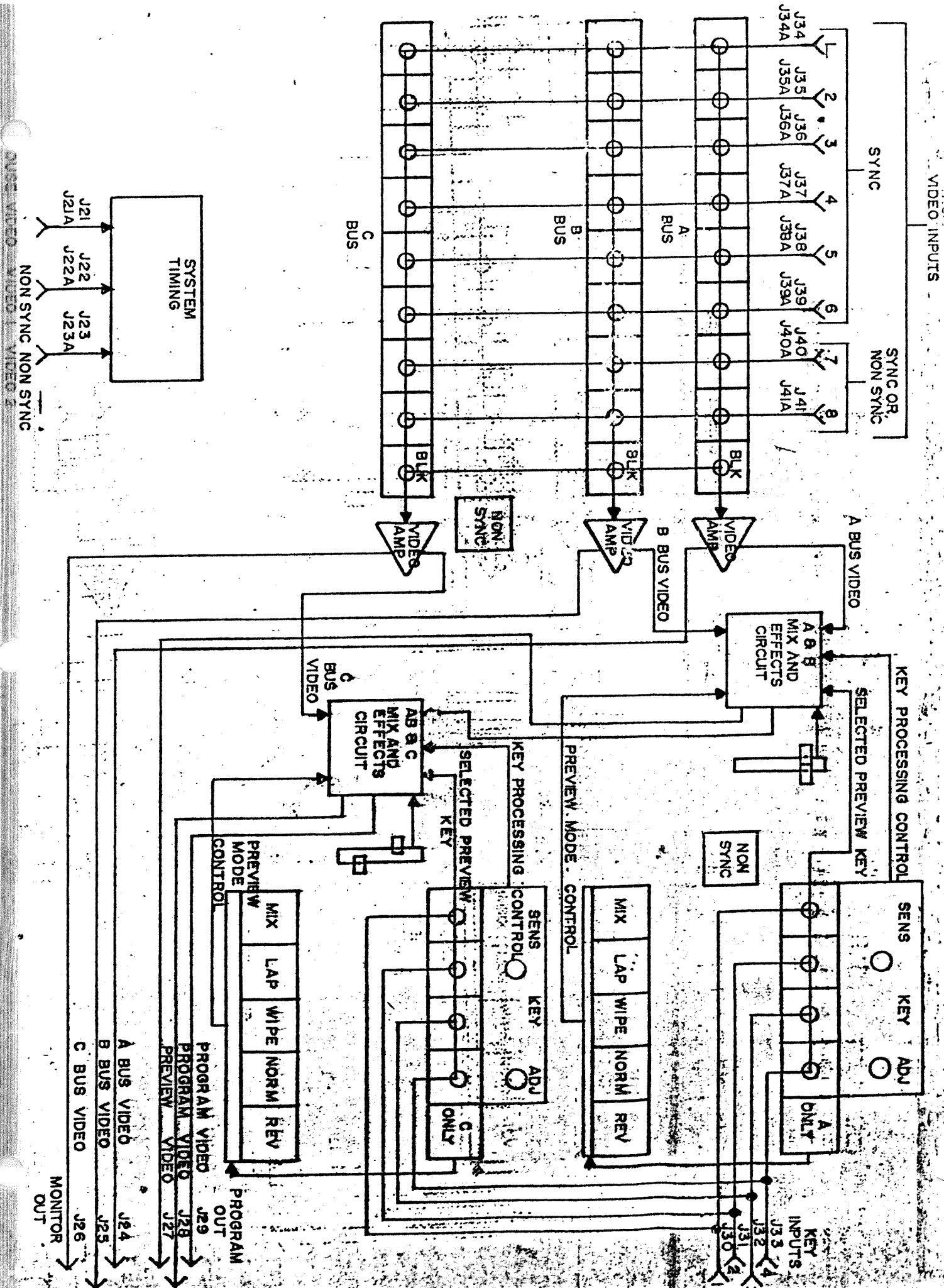
Calibration Procedure Rotation System

1. Allow system to warm up for one-half hour minimum.
2. Calibrate Scanimate completely.
3. Set section control for one section.
4. Place rate switch in X1 position.
5. Turn rate pot No. 1 fully ccw.
6. Place mode switch No. 1 in rotation sequence position.
7. Monitor tpi on front panel with scope.
8. Start rotation manually.
9. Allow to run until tpi goes 'low' momentarily.
10. Stop rotation immediately.
11. Press direction reverse switch.
12. Manually step rotation back until tpi goes 'low' again.
13. Press 'section selector' switch '1'.
14. Load this angle into 'initial' storage register.
15. This constitutes an angle of 90° as an 'initial' condition. (sine=+max., cosine = zero).

Rotation Calibration Procedure:

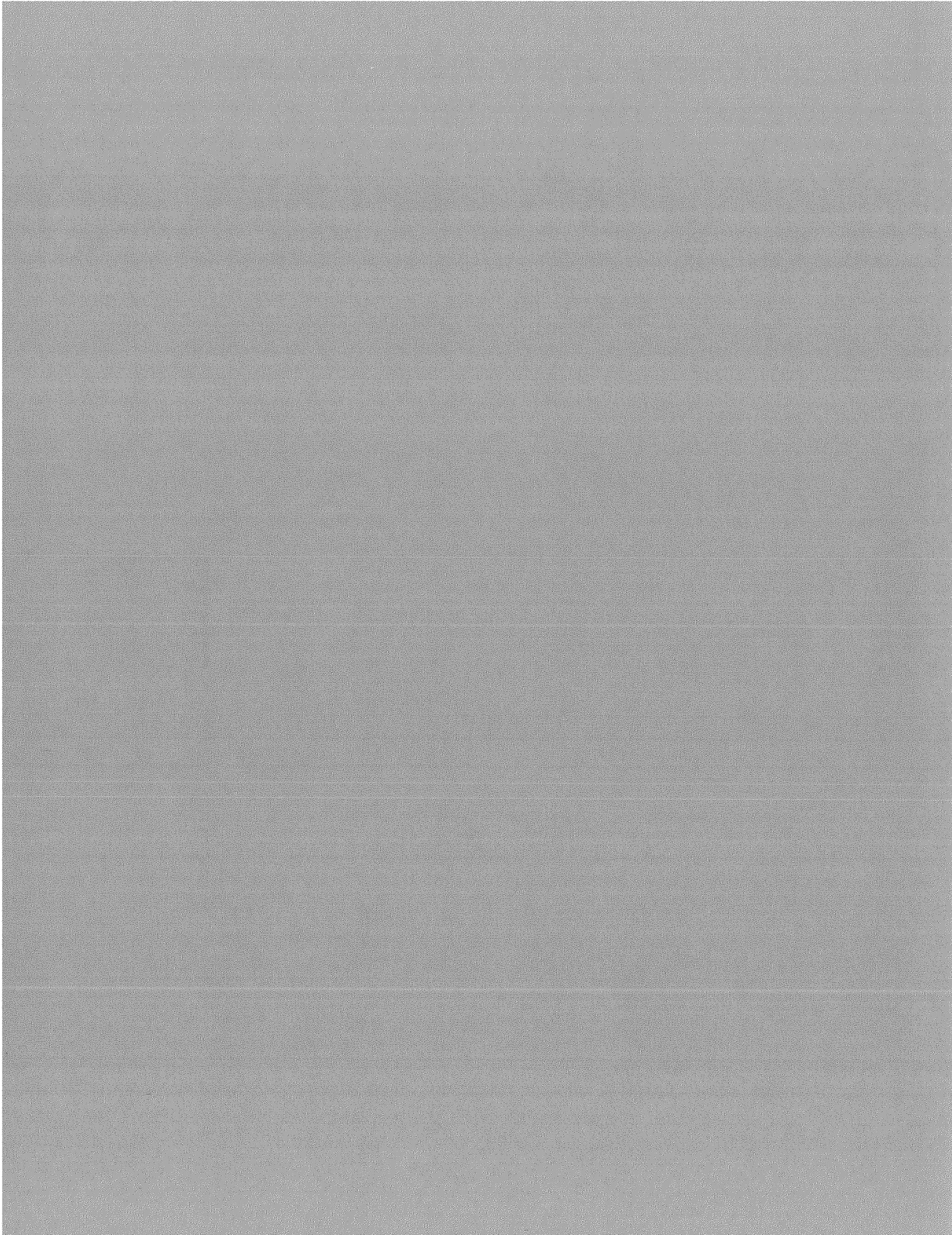
1. Monitor sine output with digital a voltmeter or other accurate, high resolution voltmeter.
2. Start rotation until a plus peak is obtained. Then stop rotation.
3. Note the plus voltage value.

4. Start rotation until a negative peak is obtained then stop rotation.
5. Note this minus voltage value.
6. Using the noted values above, adjust the sine gain for 20 volts peak to peak without regard to ground.
7. Adjust sine offset on D/A converter card for equal plus and minus excursions from ground (+10 volts).
8. It must be noted at this time that the relative amplitude is not as important as the plus and minus excursions. The plus and minus values must be as close as possible.
9. Repeat steps 1 thru 8 monitoring cosine output.
10. This concludes rotation controller calibration.



SLAVED COSINE GENERATOR ADJUSTMENTS
(AM-112A)

- A. Put Slaved Cosine Generator Bd on extender and adjust oscillator No. 3 for a medium frequency.
- B. With oscilloscope look at IC1-6 and adjust R9 for approximate symmetry, about zero volts. Final adjustment of R9 will be made in following step.
- C. With oscilloscope look at IC3-6 and adjust R9 and R15 so that the positive peaks of the waveforms are equal in amplitude and are at zero volts.
- D. With oscilloscope look at the junction of R31 and R32.
 1. Adjust RECT RAMP for continuous waveform at the zero crossing. R9 and R15 might have to be adjusted slightly.
 2. Adjust SQ WAVE for a linear waveform from positive to negative peak.
 3. Adjust SQ RAMP Zero so waveform is centered about zero volts.
- E. With oscilloscope look at the output of Board.
 1. Adjust SINE SHAPE for best-looking sine wave.
 2. With Osc. No. 4 Amplitude pot on the front panel max counter clockwise. Adjust MULT BAL for minimum oscillation.
 3. Adjust ZERO for zero volts.



ANIMATION CONTROLLER

Pots are numbered from back to front

Card #6 Sequential intensity

No pots

Card #8 Sequence ramp timing generator

No pots

Card #10 Sequential ramp generator

Pot #1 Adjusts ramp #3 sinewave output

2 Sets ramp #3 reset rate

3 Adjusts ramp #2 sinewave output

4 Sets ramp #2 reset rate

5 Adjusts ramp #1 sinewave output

6 Sets ramp #1 reset rate

Card #11 Sequential ramp generator

Pot #1 Adjusts ramp #4 sinewave output

2 Sets ramp #4 reset rate

3 Adjusts ramp #5 sinewave output

4 Sets ramp #5 reset rate

5 Adjusts spare ramp gen. sinewave output

6 Sets spare ramp gen. reset rate.

Card #13 High frequency animation oscillator

Pot #1 Sets oscillator output multiplier DC offset

2 Sets oscillator output multiplier null point

3 Sets triangle wave negative peak

4 Sets triangle wave positive peak

5 Sets triangle wave slope symmetry

6 Adjusts for best sinewave output

Card #14 High frequency animation oscillator

- Pot #1 Sets oscillator output multiplier DC offset
- 2 Sets oscillator output multiplier null point
- 3 Sets triangle wave negative peak
- 4 Sets triangle wave positive peak
- 5 Sets triangle wave slope symmetry
- 6 Adjusts for best sinewave output

Card #15 Low frequency animation oscillator

- Pot #1 Sets oscillator output multiplier DC offset
- 2 Sets oscillator output multiplier null point
- 3 Sets triangle wave negative peak
- 4 Sets triangle wave positive peak
- 5 Sets triangle wave slope symmetry
- 6 Adjusts for best sinewave output

Card #16 Low frequency animation oscillator

- Pot #1 Sets oscillator output multiplier DC offset
- 2 Sets oscillator output multiplier null point
- 3 Sets triangle wave negative peak
- 4 Sets triangle wave positive peak
- 5 Sets triangle wave slope symmetry
- 6 Adjusts for best sinewave output

Card #17 Low frequency animation oscillator

- Pot #1 Sets oscillator output multiplier DC offset
- 2 Sets oscillator output multiplier null point
- 3 Sets triangle wave negative peak
- 4 Sets triangle wave positive peak
- 5 Sets triangle wave slope symmetry
- 6 Adjusts for best sinewave output

Card #18 Audio preamp

No pots

Card #19 Dual band pass filter

Pot #1

2

3

4

Card #20 Dual band pass filter

Pot #1

2

3

4

Card #21 Dual band pass filter

Pot #1

2

3

4

Card #22, 23, 24

No pots

Card #25 Horizontal, vertical rate ramp generator

Pot #1 Sets horizontal rate ramp amplitude

2 Sets vertical rate ramp amplitude

Card #26, 27

No pots

Card #29

No pots

Card #31 Dual multiplier card

Pot #1 Sets multiplier #2 null point

2 Sets multiplier #2 output DC offset

3 Sets multiplier #1 null point

OPERATING PROCEEDURE

ANIMATION AID

I. General Description

The Animation Aid contains functional circuitry that expands the scope of operation of the Scanimate system. The Animation Aid provides:

- A. Mouth control circuitry to provide synchronization of mouth movement with an audio input of either a sound track or direct microphone input.
- B. Circuitry to sequentially intensify from 2 to 5 sections, with control of the number of frames the section is intensified.
- C. Circuitry to sequentially or manually start from 1 to 5 ramp generators. Each ramp is individually adjustable both for rate and start time. A linear ramp or sine shape may be selected.
- D. Two high frequency oscillators are provided for "raster bending". The oscillators may be phase locked on a horizontal line basis. A plus or minus cosine or a plus or minus sine function is selectable. There are provisions for controlling amplitude by either a front panel control or an external function generator. Frequency is controlled by a front panel control.
- E. Three low frequency oscillators are provided for general animation effects. As in the high frequency oscillators,

the waveform may be phase locked in either a plus or minus cosine or plus or minus sine function. In addition, a slow reset mode is available to use the oscillator as another linear or sine wave ramp generator. Two low frequency oscillators may be locked together in a special mode to produce a sine-cosine of the same frequency. As with the high frequency oscillators, frequency and amplitude are controlled with front panel controls, or the amplitude may be controlled with external functions.

- F. A dual full-wave rectifier is provided for general use.
- G. A dual multiplier is provided for multiplying any function by another function.
- H. Six summing amplifiers with three inputs each are provided for summing any of the above mentioned functions.
- I. Five gain potentiometers are provided to attenuate any function desired.
- J. Five bias potentiometers are provided to offset any function between plus and minus 15 volts.
- K. A ten by ten patch panel is provided for programming purposes. The inputs and outputs of all functions are available at the patch panel, including the gain and bias potentiometers.

II. Operation

A. Mouth Control Circuitry

The mouth control circuitry controls the movement of lips provided by artwork. A series of filters, summing

amplifiers and a limiter amplifier provide a control voltage for the upper lip, lower lip, and mouth width. This control voltage is derived from an audio input provided by tape or other high level means or a low level microphone input. Because the control voltage is derived from the audio input, the lip movement is synchronized with the sound track.

B. Sequential Intensity Generator

The sequential intensity generator intensifies one section and blanks all others. From two to five section sequences may be controlled. The number of sections used is selected by a front panel rotary switch.

A two digit thumbwheel switch is used to select the number of frames that each section is intensified.

When the switch is in the "X1" position, the thumbwheel switch reads directly (1, 2, 3, 4, up to 99). When the switch is in the "X10" position, the thumbwheel switch reads in 10's (10, 20, 30, up to 990).

The sequence starts when the switch is thrown from stop to start and will continue to cycle until the switch is returned to stop. All controls effecting the sequential intensity function are grouped inside the heavy black outline marked "sequential intensity".

C. Sequential Ramp Generator

The "manual/auto" switch must be in the "auto" position initially. This resets the ramp generators. When the

switch is thrown to "manual", the generator starts ramping at a rate determined by the "rate" pot. Each ramp may be started manually and the rate set before the automatic sequence is started.

For automatic operation, all "manual/auto" switches must be in the "auto" position.

The "initial/final" switch on Scanimate starts ramp number one. Ramp number two starts automatically at a time, set by a three digit thumbwheel switch. The switch indicates the frame number after the "initial/final" switch is thrown, that ramp two will start. Ramp number three will start when the frame occurs that coincides with the number set on the thumbwheel switch marked "start 3". The same applies for the remaining sections. The ramps may be programmed to start in any order and the rates may be set independently.

The important things to remember are that the "man/auto" switches must be in "auto" for automatic operation. The number set in the thumbwheel switch is the frame number (after the "initial/final" switch is thrown) that starts the ramp. Ramp number one starts with the "initial/final" switch. Returning this switch to "final" resets the ramp generators and the frame counters.

A triangle or sine shape may be selected by placing the switch in the proper position.

A "X1/X2" switch is located on the sequence ramp timing

generator card, and enables the frame count to be doubled when in the "X2" position, or the frame count may be stopped when in the center off position.

All controls that effect the ramp generator function are located inside the black outline marked "ramp control" except the "X1/X2" switch on the PC board.

D. High Frequency Oscillators

Oscillators number one and two are high frequency types. (Approximately 90 KHz max.)

The frequency is adjusted by the frequency pot. The amplitude is adjusted by the amplitude pot, (± 10 v max. -0v min or an external function.

These oscillators may be phase locked the same as the basic oscillators in Scanimate, only the high frequency oscillators are locked to a horizontal line instead of a vertical frame. This allows the whole raster to be shaped.

A triangle or sine shape may be selected by placing the switch in the proper position.

A "sine/cosine" switch is located on the PC board and enables the waveform to start at zero instead of plus or minus peaks, when in the phase lock mode. This switch is normally in the "cosine" mode.

All controls that effect the high frequency oscillators are located inside the black outline labeled "oscillator control" except the "sine/cosine" switch on the PC board.

E. Low Frequency Oscillators

Oscillators number 3, 4, and 5 are low frequency oscillators.

The frequency is adjusted by the frequency pot, the amplitude is adjusted by the amplitude pot or an external function.

These oscillators may be phase locked to either the frame or the sequence by placing the "frame/sequence" switch in the proper position. The waveform may be phase locked top or bottom by placing the "top/bottom" switch in the proper position.

Oscillators number 3 and 4 are wired for a cosine-sine relationship. Oscillator number 3 is the cosine reference and number 4 is the sine slave. When wired in this special mode, frequency pot number 4 is disabled and the frequency of number 4 will follow oscillator number 3.

The "sine/cosine" switch and the "fast/slow" switch on the PC board must be in the "cosine" and "fast" positions respectively when in the special cosine/sine reference/slave mode.

Oscillators number 3 and 5 may be used as normal low frequency oscillators.

The "sine/cosine" switch on the PC board is the same as the high frequency oscillator described above.

The "fast/slow" switch on the PC board disables the phase lock mode when in the "slow" position. When in this position, the oscillator will stop running and ramp to the plus or minus position. With the "frame/sequence" switch in the "frame" position, throwing the "top/bottom" switch to the opposite position will ramp the oscillator to the

other extreme position. It will remain there until the switch is again thrown to the opposite position. Thus the oscillator may be used as an additional ramp generator. A triangle or sine shape may be selected in all modes by placing the switch in the desired position.

All controls effecting the low frequency oscillators are located in the black outline labeled "oscillator controls" except the "sine/cosine" and "fast/slow" switches on the PC board.

F. Dual Full-wave Rectifier

A dual full-wave rectifier is provided for rectifying any of the functions generated by the Animation Aid or external functions. There are no external controls for this function.

G. Dual Multiplier

A dual analog multiplier is provided for multiplying one function by another or for use as a variable gain amplifier. There are no external controls for the multiplier.

H. Summing Amplifiers

Six unity gain, inverting summing amplifiers are provided for summing functions or inverting functions. There are no external controls for the summing amplifiers.

I. Gain Potentiometers

Five gain potentiometers are provided on the front panel for the purpose of attenuating functions. One side of the pot is connected to ground and the wiper and the

clock-wise side of the pot are connected to the patch panel and may be programmed as desired.

J. Bias Potentiometers

Five bias potentiometers are provided to obtain a variable DC voltage.

The clock-wise side of the pot is connected to +15 volts and the counter clock-wise side is connected to -15 volts. The wiper is connected to the patch panel and may be programmed as desired.

K. Patch Panel

A ten by ten patch panel is provided on the front panel to facilitate programming of the functions in the Animation Aid. The outputs of all generated functions of the Animation Aid are connected to the patch panel. The output circuitry is short circuit protected in case the output is accidentally shorted to ground.

The inputs to all functions generated in the Animation Aid are connected to the patch panel.

The inputs to the cherry switch on Scanimate are also connected to the patch panel on the Animation Aid.

Therefore, any function generated by the Animation Aid may be connected to Scanimate and utilized to the fullest by the ingenuity and imagination of the operator.

I. MOUTH CONTROL CIRCUITS

The mouth circuit uses the 2 high frequency oscillators for bending the raster to make the mouth move. The connections on the patch board to program in the mouth circuit are as follows:

Upper lip (H3) to oscillator 1 multiplier (A1)

Lower lip (H4) to oscillator 2 multiplier (A2)

Oscillator 1 output (B1) to cherry switch 2 (B9)

Oscillator 2 output (B2) to cherry switch 3 (C9)

Mouth width (H5) to cherry switch 4 (D9)

Divide the artwork into two sections with the upper lip on section 1 and the lower lip on section 2. Proper positioning of the artwork will follow after the oscillators are set up. On the cherry switch set final vertical section 1 to bus 2, final vertical section 2 to bus 3, size width section 1 and 2 to bus 4. Turn pots 2, 3, and 4 on cherry switch fully clockwise.

Oscillator 1 and 2 should be set to "cos" position. This switch is on the oscillator PC board and is labeled. On the front panel set oscillator 1 to "bottom" and "sinwave" positions and on oscillator 2 set to "top" and "sinwave" positions. The amplitude pots on both oscillators should be fully counter clockwise. Adjust the frequency of both oscillators so that there is a little less than one cycle of bending. To see the bending turn the "offset" on the upper and lower lip controls. The artwork must now be positioned so that when the raster is bent the zero crossings of the bend is at the ends of the lips. If the position is not exact the corners of the lips will either part or cross when the mouth is animated.

II. SEQUENCE INTENSITY GENERATOR

This circuit is used to intensify sequentially 2, 3, 4, or 5 sections. In the following example we will use five sections.

On Scanimate divide the raster into five sections.

Connect sequence intensity outputs (C1), (C2), (C3), (C4) and (C5) to (B9), (C9), (D9), (E9) and (F9) respectively. Turn the gain pots 2, 3, 4, 5, 6 on cherry switch fully clockwise. Set all five sections of green comm to zero. On cherry switch set

green section 1 to bus 2

green section 2 to bus 3

green section 3 to bus 4

green section 4 to bus 5

green section 5 to bus 6

In the block marked "sequence intensity" on the animation aid set thumbwheel switch marked frames for the number of frames that each section is intensified. In our example use 47 frames. Set rotary switch to 5 and the X10/X1 switch to X1. Set the start/stop switch to stop then to start. On the display the first section should intensify for 2 seconds and switch to second section and intensify it for two. This will continue for each section and then repeat the sequence after intensifying the fifth section. If only 2 sections are used set rotary switch to 2.

The voltages from this sequence intensity generator can also be used for moving a section instantly from one location to another and back. For example if you had section one in the lower left corner of the frame and wanted to move image to the top right part of frame and back once a second. Set frame count to 23 (the 24th

count is used to reset the counter). Set X1/X10 switch to X1. Connect a three wire jumper from (C1) to (B9), and C9. On cherry switch set final horiz section 1 to bus 2 and final vertical section 1 to bus 3. Set both pot 2 and 3 fully counter clockwise. Set start/stop switch to stop and then to start. On cherry switch turn clockwise pot 2 and 3 until the desired movement is achieved. As pots 2 and 3 are turned clockwise this will change the final position so final position pot will have to be adjusted at the same time. The movement from lower left to upper right and back to lower left will continue until the start/stop switch is switched to the stop position. If these signals are connected to the initial horiz and vertical on the cherry switch instead of the final horiz and vertical, the back and forth movement can be multiplied out in final position.

III. SEQUENTIAL RAMP GENERATOR

These five ramps can be used many ways so I will describe several different types of operations.

A. Sequence Ramp

When used as sequence ramps they must be programed different for different operations.

1. Initial/final operation

Divide the raster into two sections on Scanimate. Set function switch to commutator position and monitor the sequence commutator on scope. Set sections 1 and 2 for about +5 volts. This will get you close to final position when sequence ramps are in final position. On the Z channel PC board (J6) in Scanimate, switch the toggle switch on top of the board to sequence position.

This disables the sequence ramp in Scanimate.

The outputs of the sequence ramps on the Animation Aid are (D1), (D2), (D3), (D4) and (D5) on the patch board. For this example we will use only ramps 1 and 2. Connect (D1) to (B9) and (D2) to (C9). On cherry switch turn pots 2 and 3 fully clockwise. Set sequence section 1 to bus 2 and sequence section 2 to bus 3.

Set function switch to "sequence control" and set zero volts on both sections with sequence commutator pots when the initial/final switch is in final.

Set "initial/final" switch on Scanimate to initial. To check the rate of ramp 1, switch the "manual/auto" switch to "manual" and ramp 1 will ramp to final position at a speed set by rate 1 pot. Switch back to "auto" and ramp 1 will reset. Switch back and forth changing rate pot until desired rate is achieved. Do the same for ramp 2 adjusting rate 2 pot.

Ramp 1 will start to ramp from initial when the "initial/final" switch is changed from "initial" to "final". At this same time a frame counter is started to count the number of frames. This frame count is used to start the other four ramps. The thumbwheel switch labeled start 2 controls the start time of the second ramp. The number on the thumbwheel switch is the number frames after the "initial/final" switch is switched to final. The control of all five sections with the sequence ramps are set up the same as the two sections described above.

On the sequence ramp timing generator P.C. board JS there is a 3 position switch. The back position is the normal position for the frame counter. The center position is the "off"

position and the frame counter is stopped. The forward position is a X2 position which will double the count on the thumbwheel switches. This will extend from about 40 seconds to over 80 seconds of control on the ramps. The off position allows the operator to operate each ramp independently. This is especially good for setting up an animation.

2. Initial-final-initial operation

This operation would be similar to the A-B switch on Scanimate. In the sequence mode this operation will require 2 ramps per section and 2 summing amplifiers of the animation aid. The example I will describe will be a start at initial ramp to final hold 2 seconds and then ramp back to initial. Connect ramp 1 (D1) to the input of summing amplifier 1 (A6). Connect the output of summing amplifier 1 (D6) to input of summing amplifier 3 (A7). Connect ramp 2 (D2) to the input of summing amplifier 3 (B7). Connect the output of summing amplifier 2 (D7) to cherry switch input (B9).

Set Scanimate for one section and function sector to commutator position. Adjust sequence comm section 1 for zero volts. On cherry switch set sequence section 1 to bus 2 and turn pot 2 fully clockwise. On animation aid set switch on sequence ramp timing generator P.C. board (J3) to the middle off position. On ramp 1 set "manual/auto" switch to manual and on ramp 2 set "manual/auto" switch to manual then back to auto position. Change function selector switch to sequence control position and set for zero volts with sequence commutator section 1 control. Set rate 1 for about 1 second ramp on ramp 1 and then do the same for ramp 2.

Set thumbwheel switch "start 2" to 096. On sequence ramp timing generator P.C. board set switch to back position. On Scanimate set initial/final switch to initial and then to final. The image should move from the initial position to final in one second, hold for 3 seconds then move back to initial position in one second.

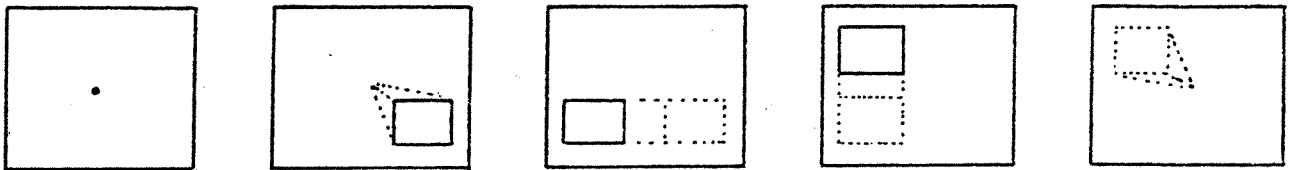
B. Single Movement of Image

The sequence ramps can be used for moving images around on the screen in either final or initial positions. The basic program is as follows: Connect D1 to B9 and on cherry switch set final horiz to bus 2 and adjust pot 2 for the proper movement on the screen. In this set up the ramp will move the image on the screen from left to right. Set final horiz on cherry switch back to Gnd and set final vertical to bus 2 and adjust pot 2 for the proper movement on the screen. When the "manual/auto" switch on ramp 1 is switched to "manual" the image will move from the bottom of screen to the top of screen. Switch the "manual/auto" switch back to auto and the image will move back to bottom of screen very fast. On cherry switch set the final vert back to Gnd and set final depth to bus 2 and adjust pot 2 for proper movement on the screen. In the auto position the image will be small and in the manual position the image will be large. If on any of the movements you would want the opposite direction the ramp output must be inverted by going through a summing amplifier. The connection for that set up could be as follows: Connect ramp 1 output (D1) to summing amplifier 1 input (A6). Connect the output of summing amp 1 (D6) to cherry switch input (B9). On cherry switch set final depth to bus 2 and adjust pot 2 for proper movement. Now when ramp 1 "manual/auto" switch is switched to

manual the image will start big and get smaller.

C. Multiple movement of image

An example to show several different movements to one image combining animation aid and scanimate. Use one section and set up Scanimate for a zoom from a point to an image less than half screen in size at final. Set final position for lower right screen. Set initial dot in center of screen. Start by programming



ramp 2 to move the image to the left. Use ramp 2 instead of ramp 1 because ramp 1 always starts with the initial/final switch set to final and the first movement of the image is to the left after reaching final position. Ramp 2 must be inverted to move the image left. Connect ramp 2 (D2) to summing amplifier 1 input (A6) and summing amplifier 1 output (D6) to cherry switch input (B9). On cherry switch set final horizontal section 1 to bus 2 and start turning pot 2 clockwise until the horizontal movement is right when ramp 2 manual/auto switch is switched back and forth. Final horizontal pot on Scanimate has to be changed each time pot 2 on cherry switch is changed because it affects the final position. Next program ramp 3 to move image up in the frame. Connect ramp 3 (D5) to cherry switch input 3 (C9) and on cherry switch set final vertical section 1 to bus 3 and adjust pot 3 until the vertical movement is right when the ramp 3 manual/auto switch is switched

back and forth. The final vertical pot on Scanimate has to be changed each time pot 3 on cherry switch is changed because it effects the final position. Last program ramp 4 to move the image back to a dot using depth. Connect ramp 4 to move the image back to a dot using depth. Connect ramp 4 (D4) to summing amplifier 3 input (A7). Connect summing amplifier 3 output (D7) to cherry switch input 4 (D9) and on cherry switch set final depth section 1 to bus 4 and adjust pot 4 for movement back to a dot as ramp 4 manual/auto switch is switched back and forth. As in the other two movements final depth on Scanimate has to be changed as pot 4 is changed.

To get the image to go to a dot in the center with depth the axis controls can be adjusted. This also changes the final position. With this adjusted go to initial position on the initial/final switch and adjust the initial position of the dot. Set the switch on the sequence ramp timing generator P.C. board (J8) to center "off" position. Set initial/final switch on Scanimate to final. Now each ramp can be adjusted for the right time by switching "manual/auto" switch back and forth on each ramp if this was not done on the initial set up. Also set thumbwheel switches for the proper start times. For this example set each ramp for 1 second and a hold time for each position of 2 seconds. The start for ramp 2 would be 072 on thumbwheel switch, start 3 would be 144, start 4 would be 216. Set initial/final to initial and the switch on the sequence ramp timing generator (J8) to the back position. Now when the initial/final switch is switched to final the image start at a dot in center and zoom to lower right and hold for 2 seconds. Then it will move horizontally to the left and hold for

2 seconds. Next it will move to the top of frame and hold for 2 seconds. Last it will zoom back to a dot.

One ramp can be added to two places to get angle movement. If the same ramp was connected to horizontal and vertical the movement would be at 45 degrees.

IV. HIGH FREQUENCY OSCILLATORS

There are two high frequency oscillators which can be used to bend or shape the raster. The outputs of them are (B1) and (B2). For the most effect use them on the initial or final vertical of the cherry switch. Both of these oscillators have a multiplier control on the input so that the amplitude of the output can be controled electronically.

PATCH PANEL.

[illegible]

also enables the external inputs for use with the sequential blanking pulse from the "animation controller" or the wiping function set up. Each switch is associated with the horizontal segment control to the left.

The "patch panel" contains the 5 sequence ramp outputs, the 5 sequential intensity pulses, the horizontal and vertical ramp generator outputs from the animation controller, the inputs and outputs of the summing amps, voltage comparators and digital inverters. Access to the offset controls and gain controls is also obtained through the patch panel.

The summing amps may be used to sum the horizontal and vertical ramps with a sequence ramp in various combinations. The composite summed function is then patched into the voltage comparators. The comparator's digital output may be used directly or patched to the digital inverters. The output is then patched into the external inputs corresponding to the desired raster segment.

The sequential intensity pulses from the animation controller may also be patched to various external inputs to sequentially blank segments of the raster.

L. A.

SER. 0102

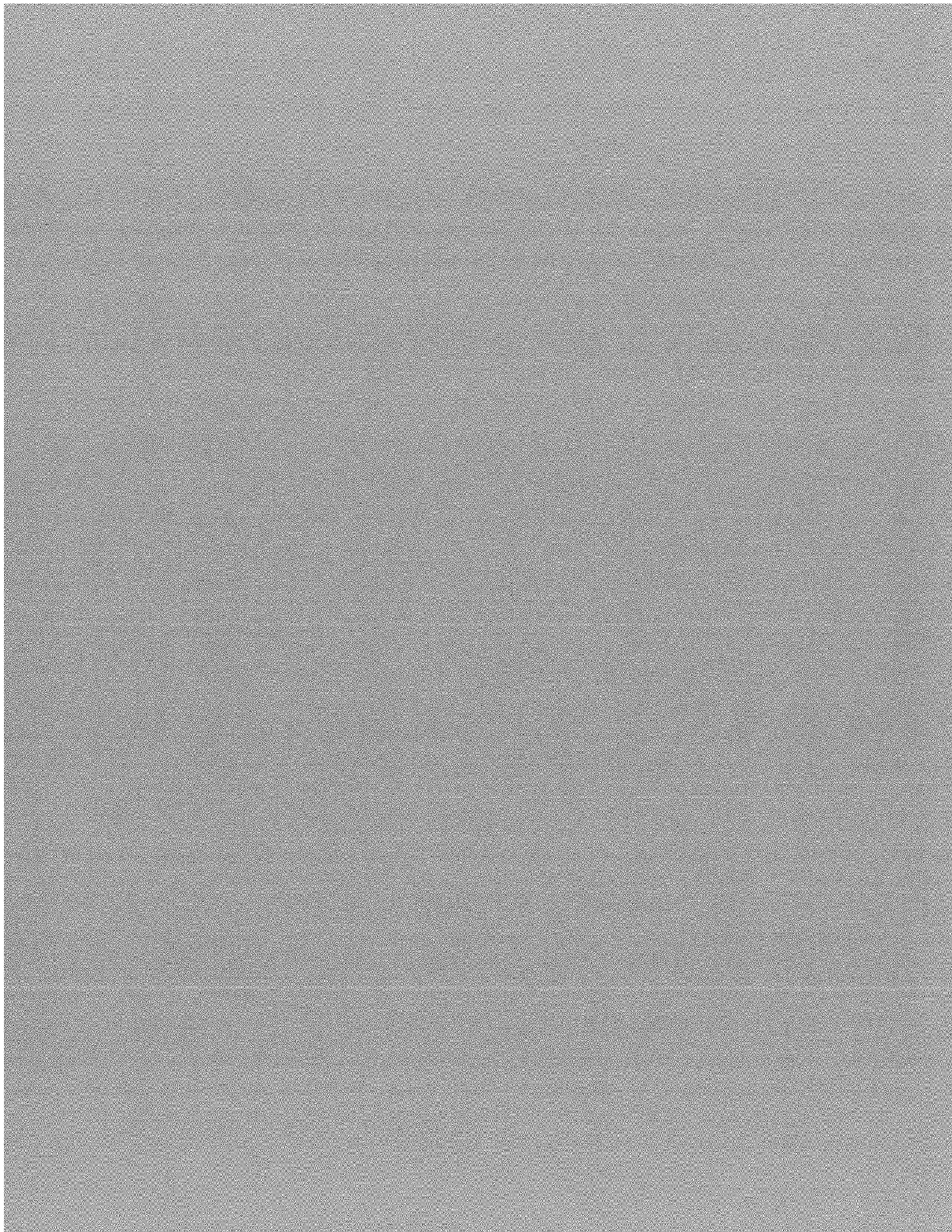
Operating Procedure Blanking Controller

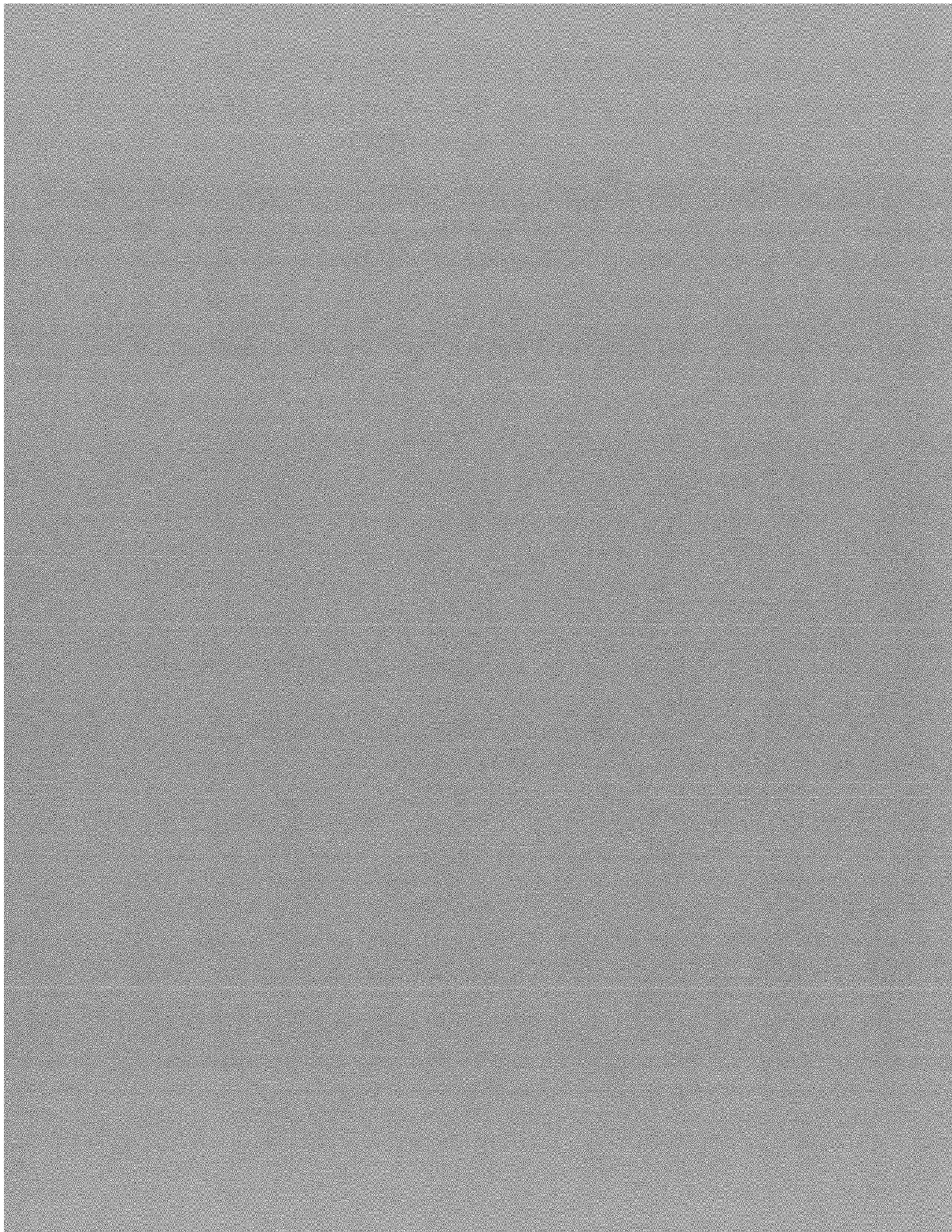
The "Blanking Controller" is used with Scanimate to blank or unblank, wipe on or off selective portions of the raster. It contains a vertical segment control portion and a horizontal segment control portion. It also contains several summing amps, voltage comparators, digital inverters, offset controls, gain controls and a large patch panel for access to various inputs, outputs and functions.

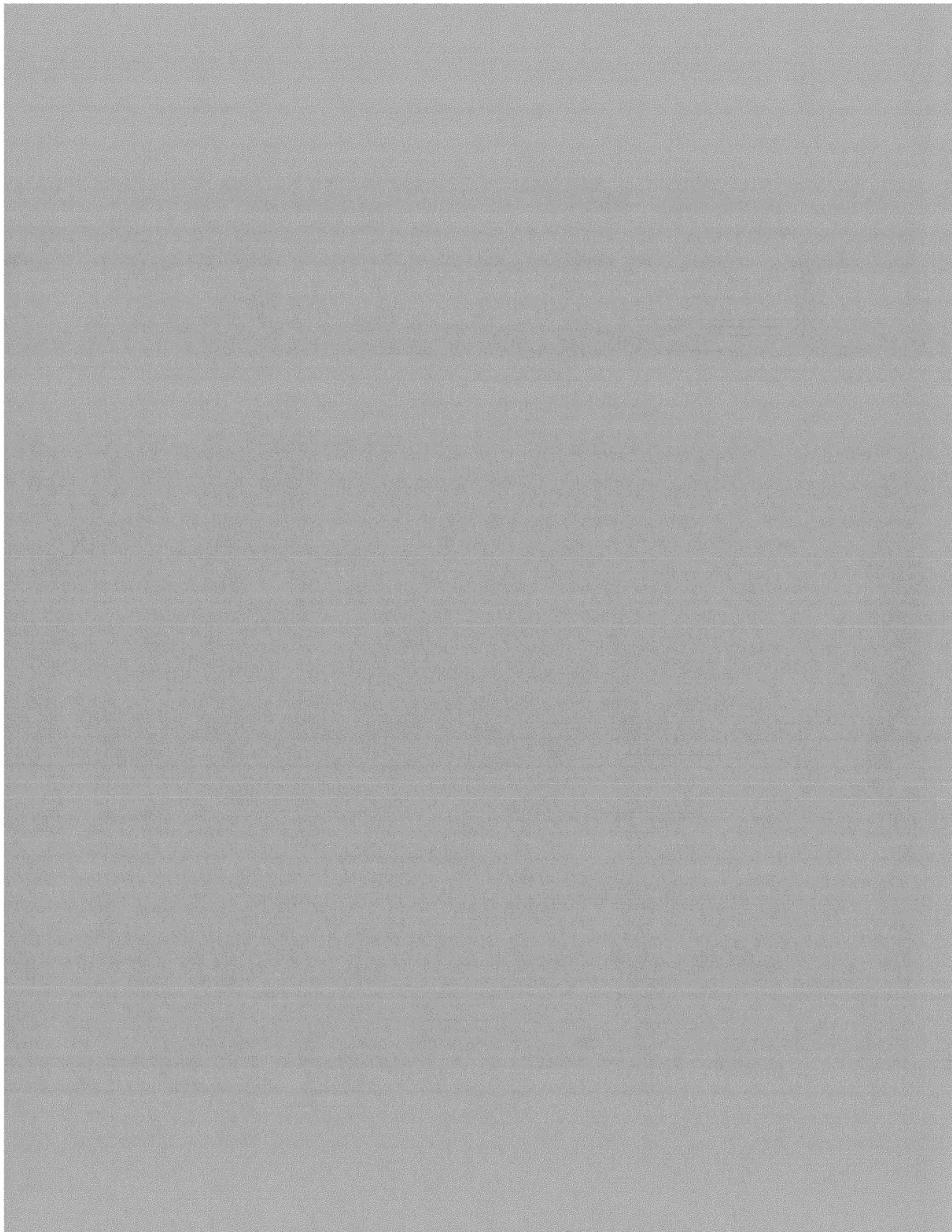
The "Vertical segment control" has 4 sets of thumbwheel switches each with three digits. The vertical segment is set up the same as the section control in Scanimate. The horizontal line number is dialed up on the switch that will start each segment.

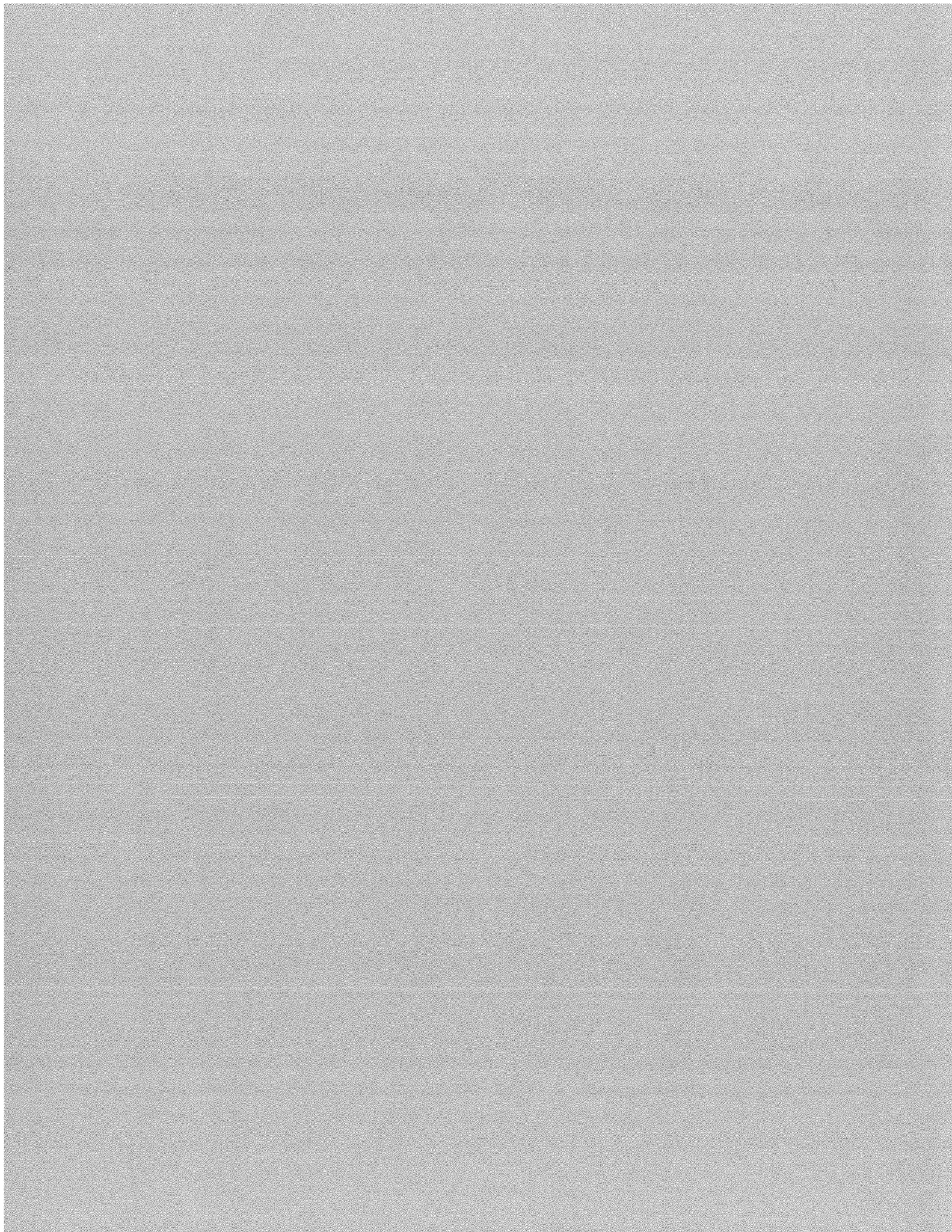
The "Horizontal segment control" consists of several (20) variable one-shots each controlled by a front panel pot. The Horizontal segment control portion of the front panel ^{is} ~~unfortunately~~ set up ~~opposite~~ the way the raster is scanned. The first pot of each vertical segment starts at the ~~right~~ ^{LEFT} hand edge of the raster and moved ^s to the ~~left~~ ^{right}. The minimum width is less than the horizontal blanking pulse. The maximum width is longer than a horizontal line. If the first horizontal segment is set shorter than a horizontal line, segment 2 will start when segment 1 ends. The same thing happens when segment 2 ends etc.

The "Inhibit/external/enable" switch determines if the segment is blanked or unblanked. When in the "enable" position, the raster segment is blanking. When in the "inhib/ext" position, the blanking function is inhibited. This position









COMPUTER IMAGE MATERIAL LIST
ELECTRIC TIMER CI-00135
RACK #1
SCANIMATE

Drawing No.	Description	No. Req'd.
CI-00068	Electric Timer Front Panel Computer Image CI-00068	1
	Panel, 1 3/4 Inch Stantron P1	1
CI-00115	Electric Timer Connector Mounting Bracket	1
SMW-107	Electric Timer Control Cable	1
	Electric Timer Standard Model S-1	1
SM-140	Electric Timer Control Card Computer Image SM-140	1
- BULBS -		
	Incandescent, T1 3/4 Midget No. 328	1
- CAPACITORS -		
	.05 ufd 100v Erie 845-000X V0 503Z	2
	Cer	
- CONNECTORS -		
	8 Pin Power Connector Cannon KPT02E16-8P	1
	4 Pin Chassis Receptacle Switchcraft 60GA4F	1
	4 Pin Cable Connector Switchcraft 09BL4M	1

COMPUTER IMAGE MATERIAL LIST
ELECTRIC TIMER
RACK #1
SCANIMATE

Drawing No.	Description	No. Req'd.
	- DIODES -	
	1N4002 Mot	2
	- HARDWARE -	
	Cable Clip H. H. Smith 774	1
	Spacer, Threaded, 4-40 x 3/8 Inch Lg.	4
	Insulated Fork Tongue Terminal, Red Burndy BA16F6	8
	Insulated Fork Tongue Terminal, Blue Burndy BA14F6	1
	Switch Lever Cap, Black Alco C-10	2
	Misc. Screws, Nuts, Washers	
	- INDICATOR LIGHTS -	
	Subminiature, MS25256, Yellow Lens Dialco 162-8430-0933-502	1
	- SONALERT -	
	2.9KHz Audio Tone, 6-28VDC Mallory SC628	1
	- SWITCHES -	
	SPDT Alco MST-105D	2
	Lever Switch Micro 311SM3-T	1
	Alternate Action P.B. Switch Grayhill 46-525B	1

(cont.)

COMPUTER IMAGE MATERIAL LIST
ELECTRIC TIMER (cont.)
RACK #1
SCANIMATE

<u>Drawing No.</u>	<u>Description</u>	<u>No. Req'd.</u>
	- SWITCHES - (cont.)	
	Momentary Action P.B. Switch Grayhill 46-125R	1
	- WIRE & CABLE -	
	4 Conductor Cable w/shield Alpha 1743	10 Ft.
	Misc. Wire	

COMPUTER IMAGE MATERIAL LIST
ELECTRIC TIMER CONTROL CARD - SM-140.
ELECTRIC TIMER
SCANIMATE

Drawing No.	Description	No. Req'd.
- CIRCUIT BOARD -		
SM-140	SM-140 Electric Timer Control Card Computer Image SM-140	1
- CAPACITORS -		
C1	1100 ufd 150 WVDC Elect Mallory CGS 112U150BF1	1
C2	68 ufd 15v Tant Dickson D68GSC15M	1
C3	22 ufd 15v Tant Dickson D22GSB15M	1
C4	1.0 ufd 25v Cer Sprague 5C023105X0250B3	1
- DIODES -		
D1	1N4002 Motorola	1
D2	1N3064 Fairchild	1
- INTEGRATED CIRCUITS -		
IC1	9601PC Fairchild	1
- RESISTORS -		
Resistors are fixed, composition $\pm$ 5% unless otherwise specified		
R1	2.7 ohm 1/2w	1
R2	5.1k ohm 1/4w	1
R3	24k ohm 1/4w	1
R4,5	1k ohm 1/4w	2

(cont.)

.COMPUTER IMAGE MATERIAL LIST
ELECTRIC TIMER CONTROL CARD - SM-140 (cont.)
ELECTRIC TIMER
SCANIMATE

Drawing No.	Description	No. Req'd.
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- TRANSFORMERS -

T1	115v Primary, 40v Secondary Triad F-90X	1
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- TRANSISTORS -

Q1	2N3569 Fairchild	1
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- HARDWARE -

	Swage Terminal PMP 1D6-1B	9
	Capacitor Mounting Clamp Mallory VR-3	1
	4-40 x 1/4 Pan Head Phillips MS	4
	#4 Internal Tooth Lockwasher	4
	4-40 Hex Nut	4

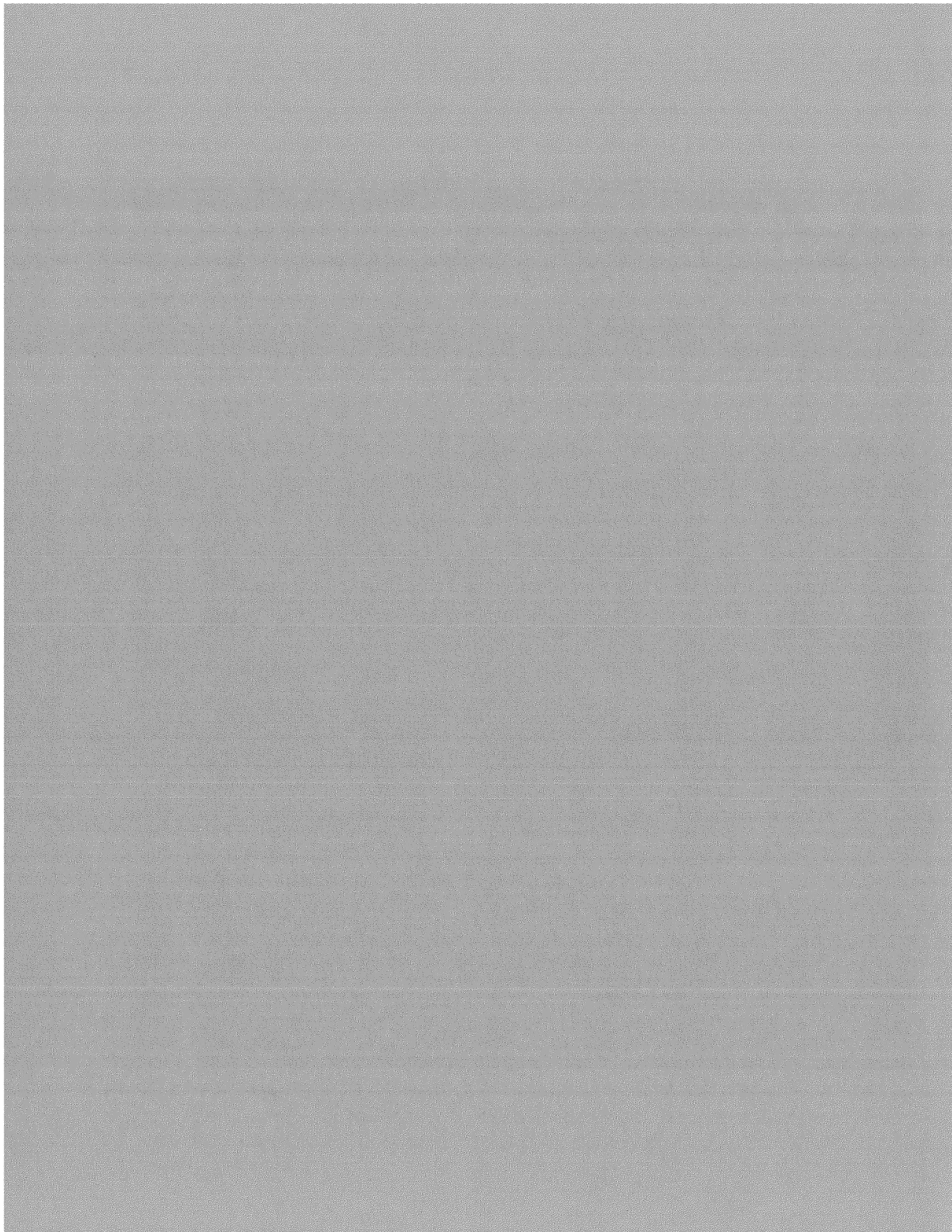
COMPUTER IMAGE MATERIAL LIST
 COMM. & SECT. CONTROL ASSY
 RACK #1
 SCANIMATE

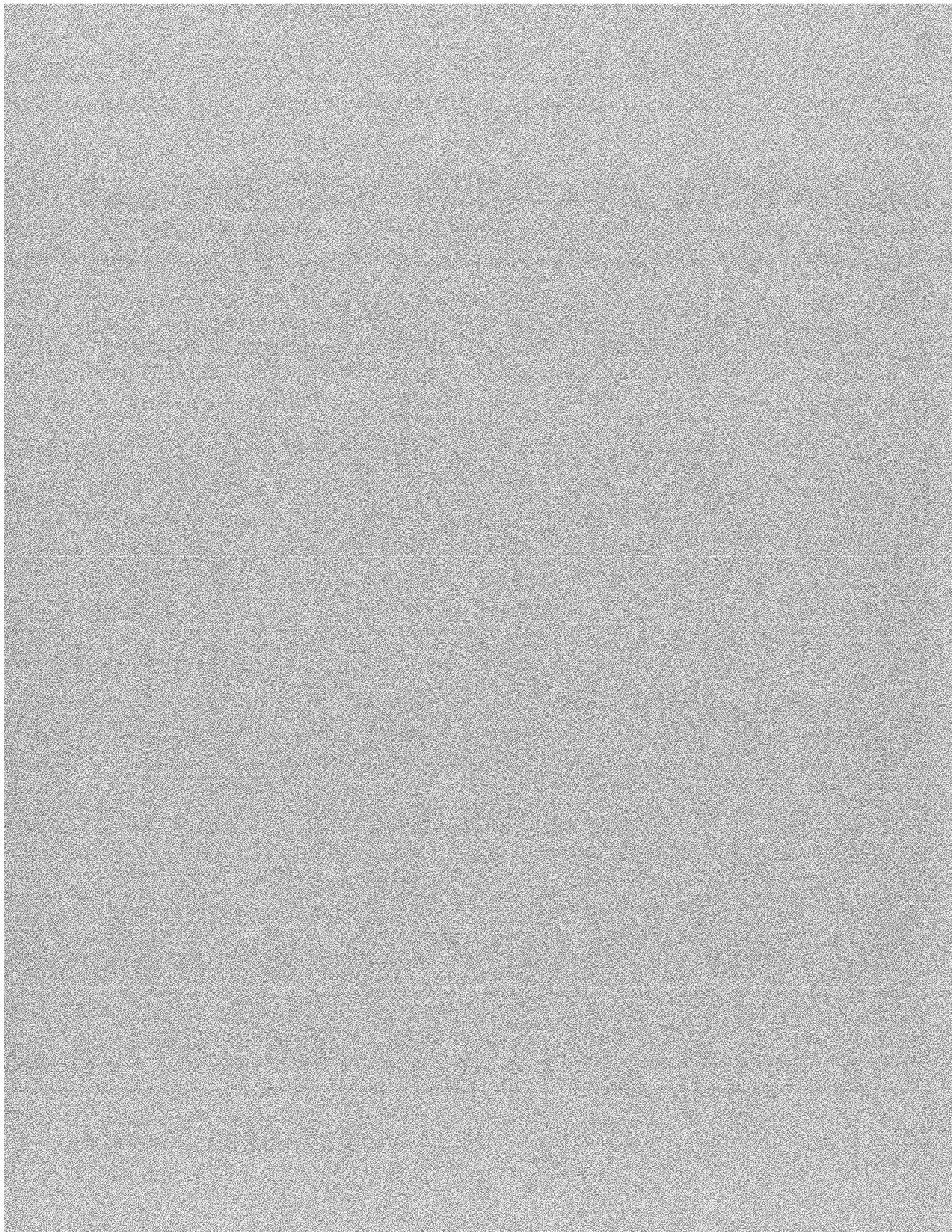
<u>Drawing No.</u>	<u>Description</u>	<u>No. Req'd.</u>
- ELECTRICAL -		
SM-102A	Sm-102A Commutator Computer Image SM-102A	5
SM-104B	SM-104B Section Line Counter & Control Computer Image SM-104B	1
	Connector P.C. Bd., 44 Terminal Viking 2VK22D/1-2	6
	Connector, 8 Terminal Cannon KPT02E16-8P	1
	Connector, 26 Terminal Burndy MS 26RM-1C	1
	Subminiature Coaxial Contact Assy Burndy RMDXK-1	16
	Connector, 42 Terminal Winchester MRE 42P-G	2
	Connector Mounting Plate Winchester XMRE 42-0100	2
- MECHANICAL -		
CI-00044	Side Panel	2
CI-00045	Back Panel	1
CI-00046	Front Angle, Right	1
CI-00047	Front Angle, Left	1
CI-00048	Support Bar, 17 Inch	2
CI-00049	Horizontal Support Bar, Connector	2
CI-00050	Side Support Bar, Connector	2

(cont.)

COMPUTER IMAGE MATERIAL LIST
 COMM. & SECT. CONTROL ASSY (cont.)
 RACK #1
 SCANIMATE

Drawing No.	Description	No. Req'd.
	- MECHANICAL - (cont.)	
CI-00051	Support Bar, Connector	2
CI-00055	Cover Panel	2
	Card Guide, 4 Inch Lg. Atlee 11903-300-5	12
	Misc. Screws, Nuts, Washers	
	Guide Pin & Socket Winchester MRA 9-66-G700	4





COMPUTER IMAGE MATERIAL LIST
 COMMUTATOR SM-102A
 COMM. & SECTION CONTROL ASSY
 SCANIMATE

Drawing No.	Description	No. Req'd.
- CIRCUIT BOARD -		
SM-102A	SM-102A Commutator Computer Image SM-102A	1
- CAPACITORS -		
C1,3,5	100 pf 500v GI RDM15 FD101J05 Mica	3
C7,8	100 ufd 25v M/E ET101X025A5 Elect	2
- DIODES -		
D1,2,3,4,5,6,9, 10,11,12,13,14, 15,16,17,18,19,20	1N3064 Fairchild	18
D7,8	1N4740 10v 1w Zener	2
- INTEGRATED CIRCUITS -		
IC1,2,3	ICL8007CTV Intersil	3
- RESISTORS -		
Resistors are fixed, composition + 5% unless otherwise indicated.		
R1,4,7,10,13,24, 27,30,33,36,47, 50,53,56,59	10k ohm 1/2w 30% Var CTS CFVA-45	15
R2,5,8,11,14,25, 28,31,34,37,48, 51,54,57,60	20k ohm 1/4w	15
R3,6,9,12,15,17, 26,29,32,35,38, 40,49,52,55,58, 61,63	20k ohm 1/8w 1% Prec	18

(cont.)

COMPUTER IMAGE MATERIAL LIST
 COMMUTATOR SM-102A (cont.)
 COMM. & SECTION CONTROL ASSY
 SCANIMATE

Drawing No.	Description	No. Req'd.
- RESISTORS -		
R16,39,62	6.2k ohm 1/4w	3
R20,21,43,44, 66,67	15k ohm 1/4w	6
R22,23,45,46, 68,69	39 ohm 1/4w	6
R70,71	5.1 ohm 1/2w	2
R72,75	120 ohm 1/2w	2
R74,75,76	200 ohm 1/4w	3
- TRANSISTORS -		
Q1,3,5,7,9,13, 15,17,19,21,25, 27,29,31,33	2N5462 Mot	15
Q2,4,6,8,10,14, 16,18,20,22,26, 28,30,32,34	2N4351 Mot	15
Q11,23,35	2N3569 Fairchild	3
Q12,24,36	2N3644 Fairchild	3
- HARDWARE -		
CI-00052	Commutator Front Panel	1
CI-00054	P.C. Board to Front Panel Bracket	2
	Knob, Concentric w/Indicator, Black Buckeye SS-50L-1/70C-2	15
	Thumbscrew, 10-32NC-2 Raytheon CS-122	2

(cont.)

COMPUTER IMAGE MATERIAL LIST
COMMUTATOR SM-102A (cont.)
COMM. & SECTION CONTROL ASSY
SCANIMATE

<u>Drawing No.</u>	<u>Description</u>	<u>No. Req'd.</u>
	- HARDWARE -	
	Panel Insert 10-32NC-2 Raytheon PIN-122	2
	Misc. Screws, Nuts, Washers	

COMPUTER IMAGE MATERIAL LIST
SECTION LINE COUNTER & CONTROL SM-104B
COMM. & SECT. CONTROL ASSY
SCANIMATE

Drawing No.	Description	No. Req'd.
- CIRCUIT BOARD -		
SM-104B	SM-104B Section Line Counter & Control Computer Image SM-104B	1
- CAPACITORS -		
C1	100 ufd 25v M/E ET101X025A5	1
C2,3,4,5,	.1 ufd 12v Erie 5655-000 Y5FO 104M	4
C6,8	470 pf 500v GI RDM15 FD471J03	2
C7,9,10,11, 12,13	1000 pf 500v GI RDM15 FA102J03	6
C14,15,16,17	24 pf 500v GI RDM15 ED240J03	4
- DIODES -		
D1 thru D96	1N3064 Fairchild	96
- INTEGRATED CIRCUITS -		
1C1,4	SN7440N TI	2
1C2,3	Mc 853P Mot	2
1C5,6,7,8,9	SN7410N TI	5
1C10,12,14	SN7490N TI	3
1C11,13	SN7404N TI	2

(cont.)

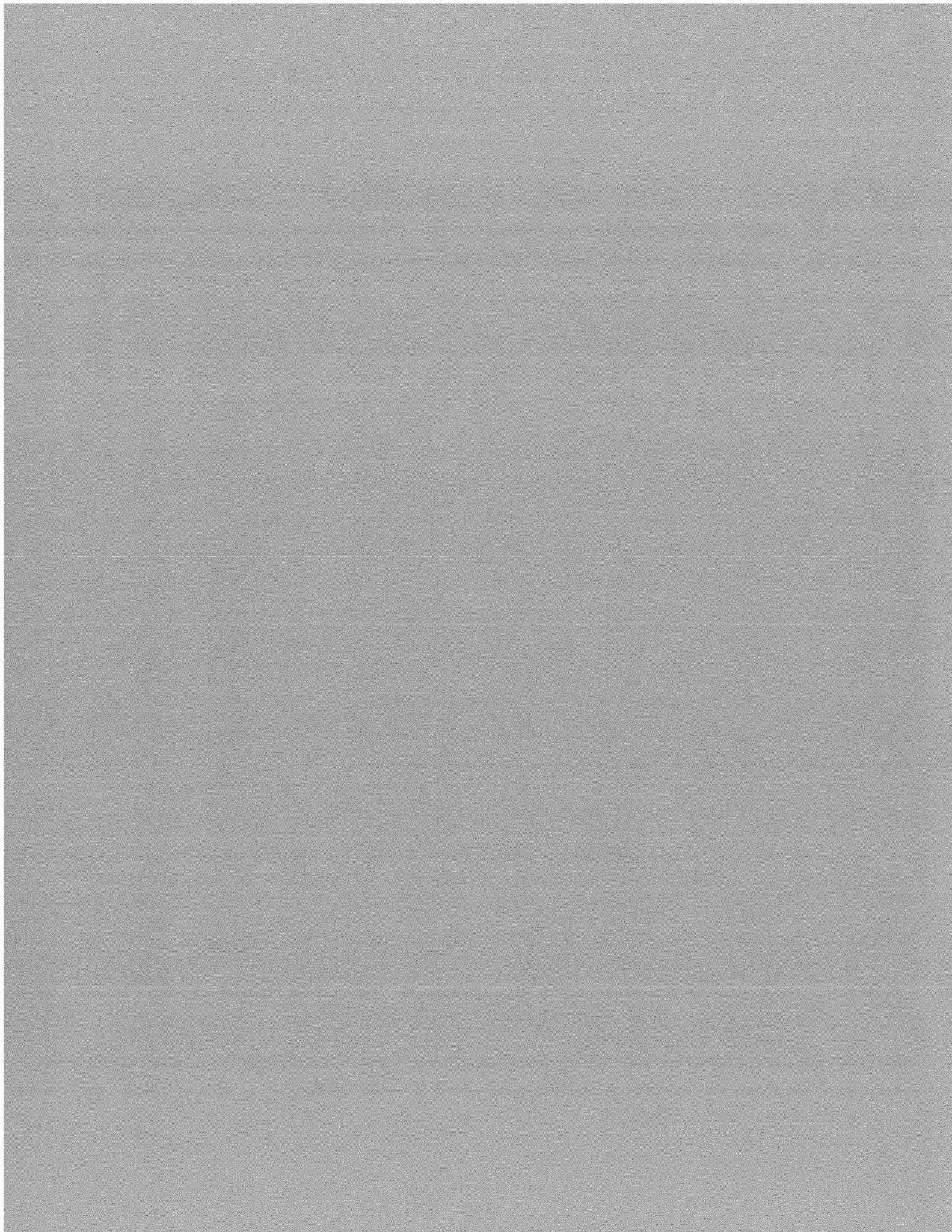
COMPUTER IMAGE MATERIAL LIST
SECTION LINE COUNTER & CONTROL SM-104B (cont.)
COMM. & SECT. CONTROL ASSY
SCANIMATE

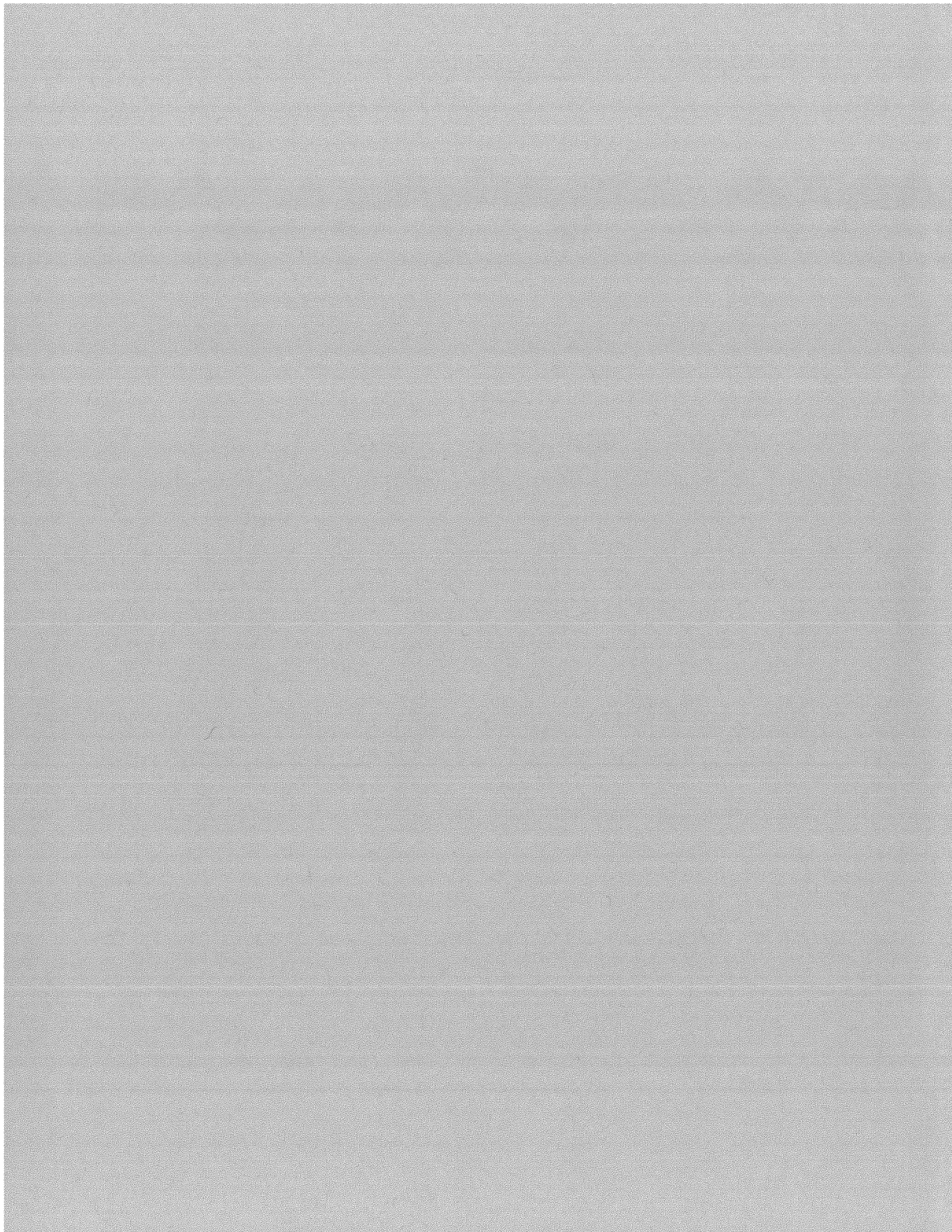
Drawing No.	Description	No. Req'd.
- RESISTORS -		
Resistors are fixed, composition $\pm$ 5% unless otherwise indicated		
R1	2.7ohm 1/2w	1
R2,4,5,6,8, 9,10,11,14, 15,18,19,22, 23	5.6k ohm 1/4w	14
R3,7	8.2k ohm 1/4w	2
R12,16,20,24, 26	5.1k ohm 1/4w	5
R13,17,21,25, 27	5k ohm 1/4w	5
R28	200 ohm 1/4w	1
R29,30,31,32	10k ohm 1/4w	4
- SWITCHES -		
S1	Rotary, 17 position, Non Shorting Mallory 32117J	1
S2	Thumbwheel, BCD w/Complement 1248 EECO E-032371-1	1
- TRANSISTORS -		
Q1,2,3,4,5	2N5134 Fairchild	5
- HARDWARE -		
CI-00054	P.C. Board to Front Panel Bracket	2
CI-00053	Section Control Front Panel	1

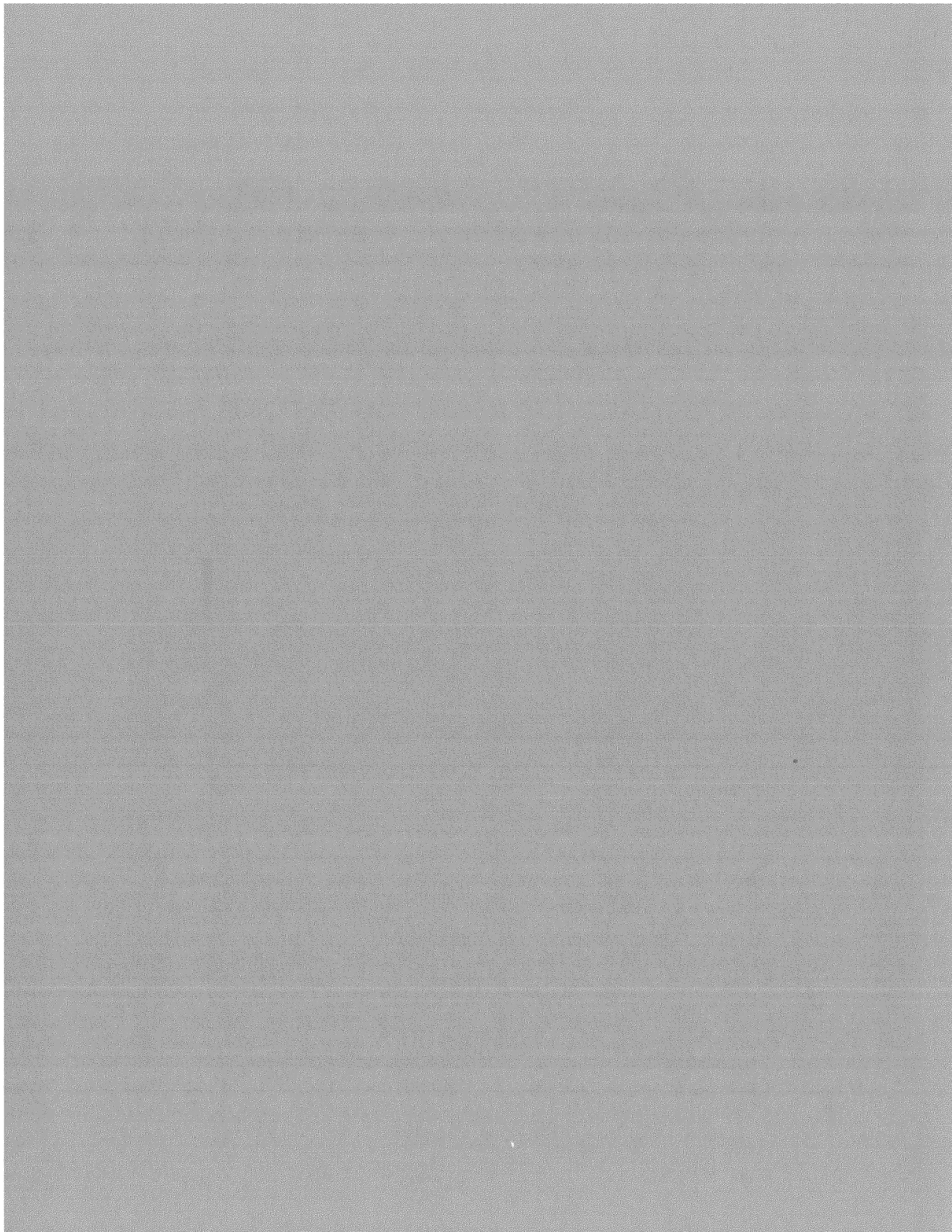
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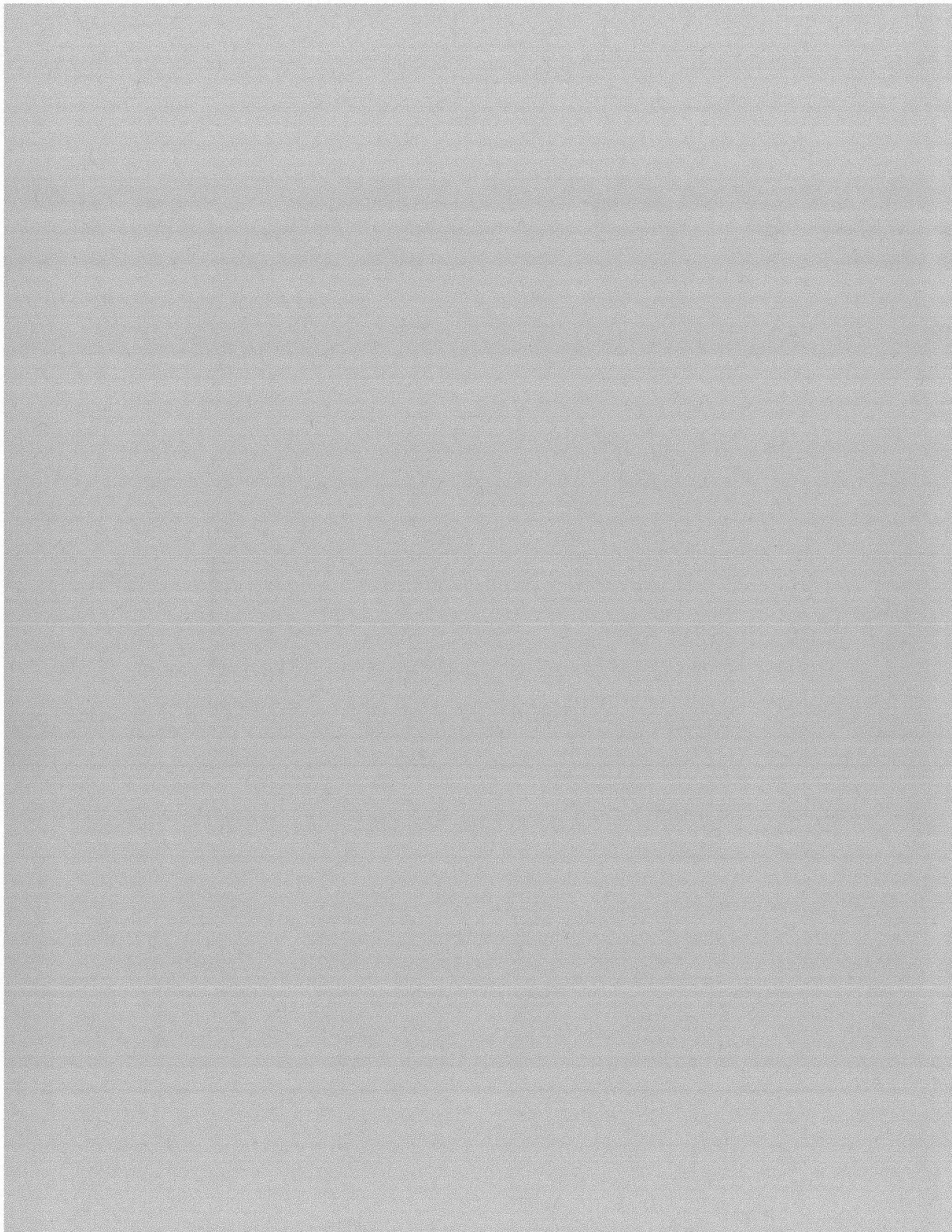
COMPUTER IMAGE MATERIAL LIST
SECTION LINE COUNTER & CONTROL SM-104B (cont.)
COMM. & SECT. CONTROL ASSY
SCANIMATE

<u>Drawing No.</u>	<u>Description</u>	<u>No. Req'd.</u>
	- HARDWARE - (cont.)	
	Knob, Bar, Black Buckeye SS-70BL-2	1
	Thumbscrew, 10-32Nc-2 Raytheon CS-122	2
	Panel Insert 10-32NC-2 Raytheon PIN-122	2
	Misc. Screws, Nuts, Washers	
	- WIRE & CABLE -	
	24 AWG Teflon	20 Ft.
	RG 174/U Coax	10 Ft.









COMPUTER IMAGE MATERIAL LIST
Z CHANNEL CARD - SM-100B
CPU
SCANIMATE

Drawing No.	Description	No. Req'd.
- CIRCUIT BOARD -		
SM-100B	SM-100B Z Channel Card Computer Image SM-100B	1
- CAPACITORS -		
C1,2	100 ufd 25v M/E ET101X025A5	Elect 2
C3,4,6,7,14,15,20, 21,27,28,29,31,32, 34,35,38,39,40,41, 44,45,46,47,50,51, 52,53	.01 ufd 100v Sprague TG-S10	Cer 27
C3,9	200 pf 500v GI RDM15 FD201J03	Mica 2
C10,13,19,25,54	100 pf 500v GI RDM15 FD101J03	Mica 5
C11,12,18,33	.002 ufd 1kv Sprague 5GA-D20	Cer 4
C16,23	5 pf 500v GI RDM15 CD050J03	Mica 2
C17,42,43,48,49	1 ufd 25v Sprague 5C023105X0250B3	Cer 5
C22,24	.001 ufd 1kv Sprague 5GA-D10	Cer 2
C26,55	50 pf 500v GI RDM15 ED500J03	Mica 2
C50	500 pf 500v GI RDM15 FD501J03	Mica 1
C36,37	2.2 ufd 50v Dickson D2R2GSD50M	Tant 2
C56,57	.1 ufd 12v Erie 5633-000 Y5FO 503M	Cer 2

(cont.)

COMPUTER IMAGE MATERIAL LIST
Z CHANNEL CARD - SN-100B (cont.)
CPU
SCANINATE

Drawing No.	Description	No. Req'd.
D1,2,3,4,5,6,7,8,9	IN3064 Fairchild	9
IC1	- INTEGRATED CIRCUITS - LM302 NSC	1
IC2	USB7740 393 Fairchild	1
IC3,13	USB7741 393 Fairchild	2
IC4	USB7710 393 Fairchild	1
IC5,6,9,14	MC 1439G Mot	4
IC7,10	MC 1595L Mot	2
IC8,11,12	741C-LN Intersil	3
Resistors are fixed, composition + 5% unless otherwise indicated		
R1,2	10 ohm 1/2w	2
R3,29,56,57,85,86,128,131	1k ohm 1/4w	8
R4	178k ohm 1/8w 1% Prec	1
R5,23,50,51,66,67,95,96,122,127	15k ohm 1/4w	10
R6	11k ohm 1/4w	1
(cont.)		

COMPUTER IMAGE MATERIAL LIST
Z CHANNEL CARD - SN-100B (cont.)
CPU
SCANINATE

Drawing No.	Description	No. Req'd.
R7	- RESISTORS - (cont.) 3.9k ohm 1/4w	1
R10,15,70,71,74,101,102,103	10k ohm 1/8w 1% Prec	8
R11,12,26,55,61,91,95,159	2k ohm 1/4w	8
R16,18	1k ohm 1/8w 1% Prec	2
R17,19	3.01k ohm 1/8w 1% Prec	2
R20,24,39,47,82	390 ohm 1/4w	5
R21,30,31,38,40,48,54,62,85,89,92	10k ohm 1/4w	11
R22,41,44,49,78,80,84,110,111,117,125,132,133	20k ohm 1/8w 1% Prec	13
R25	1.6k ohm 1/4w	1
R27,129	53k ohm 1/4w	2
R28,43,157	5.1k ohm 1/4w	3
R42,119	5k ohm 3/4w Beckman 89PR5K 10% Var	2
R45	20k ohm 1/4w	1
R46	6.2k ohm 1/4w	1
R55,55,123,124	10 ohm 1/4w	4
R58,90	10k ohm 3/4w Beckman 89PR10K 10% Var	2
R63,64,97,98	13.7k ohm 1/4w 1% Prec	4
R65,94	1.2k ohm 1/4w	2
R63,69,99,100	1.5k ohm 1/8w 1% Prec	4
(cont.)		

COMPUTER IMAGE MATERIAL LIST
Z CHANNEL CARD - SM-100B (cont.)
CPU
SCANIMATE

Drawing No.	Description	No. Req'd.	Drawing No.	Description	No. Req'd.
	- RESISTORS - (cont.)			- HARDWARE -	
R75,104	8.66k ohm 1/8w 1%	2		Card Ejector	1
R75,108	84.5k ohm 1/8w 1%	2		Scanbe S-200	
R79,112	30k ohm 1/4w	2			
R81,114	3.3k ohm 1/4w	2			
R118,120	20k ohm 3/4w 1% Beckman 89PR20K	2			
R121	2k ohm 3/4w 1% Beckman 89PR2K	1			
R126	3k ohm 1/4w	1			
R134	24k ohm 1/4w	1			
R135,136	330k ohm 1/4w	2			
R138,139	51k ohm 1/4w	2			
	- TRANSISTORS -				
Q1,5	2N5134 Fairchild	2			
Q2	2N4551 Mot	1			
Q3,8	2N3569 Fairchild	2			
Q4,9	2N3644 Fairchild	2			
Q6	2N5133 Fairchild	1			
Q7	2N5139 Fairchild	1			
Q10,11	2N4342 Fairchild	2			

(cont.)

COMPUTER IMAGE MATERIAL LIST
X OR Y CHANNEL CARD - SM-101B (cont.)
CPU
SCANIMATE

Drawing No.	Description	No. Req'd.
- RESISTORS -		
Resistors are fixed, composition $\pm$ 5% unless otherwise specified		
R1, 43, 81	30k ohm 1/4w	3
R2, 5, 55, 82 111	20k ohm 1/4w	5
R4, 51, 52, 36, 37, 84	20k ohm 1/8w 1%	6
R5, 83	3.3k ohm 1/4w	2
R3, 11, 53, 61, 87, 89	1k ohm 1/4w	6
R9, 62, 90	20k ohm 3/4w Beckman 89PR20K	3
R10, 60, 88	10k ohm 3/4w Beckman 89PR10K	3
R12, 15, 65, 65, 92, 93	2k ohm 1/4w	6
R13, 16, 64, 66, 91, 94	10k ohm 1/4w	6
R17, 18, 70, 71, 98, 99	13.7k ohm 1/8w 1%	6
R19, 67, 95	1.21k ohm 1/8w 1%	3
R20, 21, 59, 44, 68, 69, 96, 97	15k ohm 1/4w	8
R22, 25, 72, 73, 100, 101	1.5k ohm 1/8w 1%	6
R24, 25, 26, 74, 75, 76, 102, 105, 105	10k ohm 1/8w 1%	9
R27, 77, 106	8.66k ohm 1/8w 1%	3
R28, 78, 104	84.5k ohm 1/8w 1%	3
R33, 53, 48	330k ohm 1/4w	3
R40, 45	2.7 ohm 1/4w	2
R41, 42	39 ohm 1/4w	2

(cont.)

COMPUTER IMAGE MATERIAL LIST
X OR Y CHANNEL CARD - SM-101B
CPU
SCANIMATE

Drawing No.	Description	No. Req'd.
- CIRCUIT BOARD -		
SM-101B	SM-101B X or Y Channel Card Computer Image SM-101B	1
- CAPACITORS -		
C1	100 pf 500v GI RDM15 FD101J03	1
C2, 3, 4, 6, 8, 9, 10, 11, 17, 18, 23, 24, 29, 30, 35, 36, 37, 38, 41, 42, 43, 44	.01 ufd 100v Sprague TG-S10	22
C5, 19, 21, 25	5 pf 500v	4
C7	GI RDM15 CDO58DQ3 39 pf 500v	1
C27, 28	GI RDM15 ED390J03 100 ufd 25v Amperex ET101X025A5	2
C31, 32, 33, 34, 39, 40	1 ufd 25v Sprague SC023105X0250B3	6
- DIODES -		
D1, 2, 3, 4, 5, 6	1N3064 Fairchild	6
- INTEGRATED CIRCUITS -		
IC1, 3, 8, 10	ICL8007CTV Intensil	4
IC2, 6, 9	MC1595L Mot	3
IC4	HA2-2515-5 Harris	1
IC7	741C-LN Intensil	1

(cont.)

COMPUTER IMAGE MATERIAL LIST
RAMP GENERATOR CARD - SM-103A
CPU
SCANIMATE

COMPUTER IMAGE MATERIAL LIST
X'OR Y CHANNEL CARD - SM-101B (cont.)
CPU
SCANIMATE

Drawing No.	Description	No. Req'd	Drawing No.	Description	No. Req'd
	- RESISTORS - (cont.)		SM-103A	- CIRCUIT BOARD - SM-103A Ramp Generator Card Computer Image SM-103A	1
R109,110	5.1 ohm 1/2w	2			
R112,113	51k ohm 1/4w	2	C1,2	100 ufd 25v Amperex ET101X025A5	2
	- TRANSISTORS -		C3,16	50 pf 500v GI RDM15 ED500J03	2
Q1	2N3569 Fairchild	1	C4,17	510 pf 500v GI RDM15 ED501J03	2
Q2	2N3644 Fairchild	1			
Q3,4	2N4342 Fairchild	2	C6,7,9,10,11,12,14, 15,20,21,22,23,27, 25,27,28	.01 ufd 100v Sprague TG-S10	16
	- HARDWARE -		C8	.1 ufd 100v Sprague 225P10491	1
	Card Ejector Scanbe S-200	1	C13,26	150 pf 500v GI RDM15 FDI51J03	2
TP1,2,3,5,6,7	Swage Terminals PNP ID4-6B	6	C19	5100 pf 500v GI RDM19 FDS12J03	1
			D1,2,3,4	IN3064 Fairchild	4
				- DIODES -	
			IC1,3,4,6	40J Analog Devices	4
			IC2,5	MC1595L Not	2
				- INTEGRATED CIRCUITS -	

(cont.)

COMPUTER IMAGE MATERIAL LIST
RAMP GENERATOR CARD - SN-103A (cont.)
CPU
SCANIMATE

COMPUTER IMAGE MATERIAL LIST
RAMP GENERATOR CARD - SN-105A (cont.)
CPU
SCANIMATE

Drawing No.	Description	No. Req'd.	Drawing No.	Description	No. Req'd.
- TRANSISTORS -					
Q1	2N5133 Fairchild	1	- RESISTORS -		
Q2,7	2N4916 Fairchild	2	Resistors are fixed, composition $\pm 5\%$ unless otherwise indicated		
Q3,8	MEM517C GI	2	R1,2	5.1k ohm 1/2w	2
Q4,9	2N3569 Fairchild	2	R3,35	51k ohm 1/4w	2
Q5,10	2N3644 Fairchild	2	R4,5,14,18,36,37 46,50,51,52	10k ohm 1/4w	8
Q6	2N5134 Fairchild	1	R5,58	5.1k ohm 1/4w	2
- HARDWARE -					
	Card Ejector Scanbe S-200	1	R7,19,20,39,51, 52,66,67	1k ohm 1/4w	8
	Jack Cambion 3704-1-03	24	R3,9,22,25,41, 44,54,55	15k ohm 1/4w	8
			R10	180k ohm 1/4w	1
			R11,12,42,43	10 ohm 1/4w	4
			R15,17,45,49	2k ohm 1/4w	4
			R15,16,47,48	10k ohm 3/4w Beckman 89PR10K	4
			R21,53	1.21k ohm 1/8w	2
			R24,25,56,57	13.7k ohm 1/8w	4
			R26,27,58,68	1.5k ohm 1/8w	4
			R28,29,31,59,60 62	10k ohm 1/8w	6
			R30,61	9.09k ohm 1/8w	2
			R32,63	84.5k ohm 1/8w	2
			R33,64	20k ohm 3/4w Beckman 89PR20K	2
			R34,65	330k ohm 1/4w	2
			R40	6.8k ohm 1/4w	1

(cont.)

COMPUTER IMAGE MATERIAL LIST
SYNCH CARD FOR T.V. RATES - SM-144 (cont.)
CPU
SCANIMATE

Drawing No.	Description	No. Req'd.
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- RESISTORS -

Resistors are fixed, composition $\pm 5\%$ unless otherwise specified

R1	5.1 ohm	1/2w	1
R2,5	5.6k ohm	1/4w	2
R4,5	24k ohm	1/4w	2
R6	200 ohm	1/4w	1
R7	20k ohm	1/4w	1
R8	750 ohm	1/4w	1
R9,10,11,12	5.1k ohm	1/4w	4

- TRANSISTORS -

Q1	2N5457		1
	Not		

- HARDWARE -

Card Ejector
Scanbe S-200

COMPUTER IMAGE MATERIAL LIST
SYNCH CARD FOR T.V. RATES - SM-144
CPU
SCANIMATE

Drawing No.	Description	No. Req'd
-------------	-------------	-----------

- CIRCUIT BOARD -

SM-144	SM-144 Synch Card For T.V. Rates Computer Image SM-144	1
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- CAPACITORS -

C-	100 ufd	25v	Elect	1
	M/E ET101X025A5			
C2	300 pf	500v	Mica	1
	GI RDM15 FD301J03			
C3	22 ufd	15v	Tant	1
	Dickson D22GSB15K			
C4,6	.1 ufd	12v	Cer	2
	Erie 5655-000 Y5FO 104M			
C5	.01 ufd	100v	Nylar	1
	Elmenco 1DP-1-103			
C7	5000 pf	500v	Mica	1
	GI RDM15 FD361J05			

- INTEGRATED CIRCUITS -

IC1	NC4044P			1
	Not			
IC2	NC4024P			1
	Not			
IC5,6	MC855P			2
	Not			
IC9,10	MC3029P			2
	Not			
IC11,15	SN7400N			2
	TI			
IC12	DM8520N			1
	NSC			

(cont.)

COMPUTER IMAGE MATERIAL LIST
SCANIMATE SYNC GENERATOR (cont.)
SM-105F
SCANIMATE

Drawing No.	Description	No. Req'd.
D5, 4, 6	IN3064 Fairchild.	3
	- DIODES -	
IC2, 12	- INTEGRATED CIRCUITS - USB7710393 Fairchild	2
IC3	MC4044P Mot	1
IC4	MC4024P Mot	1
IC5, 8, 20, 23	MC853P Mot	4
IC6, 9, 11	AY9602PC Fairchild	3
IC7	MC838P Mot	1
IC10, 16, 17, 18, 19, 21	DM8520 NSC	6
IC13, 14, 15, 22	SN7400N TI	4
IC24, 25, 26	MC3029P Mot	3
	- RESISTORS -	
Resistors are fixed composition + 5% unless otherwise specified.		
R1, 2	5.1 ohm 1/2w	2
R4, 14, 15, 37, 38, 43, 49, 50, 51, 52, 53, 54, 55, 61	5.6k 1/4w	14
	(cont.)	

COMPUTER IMAGE MATERIAL LIST
SCANIMATE SYNC GENERATOR
SM-105F
SCANIMATE

Drawing No.	Description	No. Req'd.
	SM-105F Sync Generator Computer Image SM-105F	1
	- CAPACITORS -	
C1, 2, 3	100 uf 25v M/E ET101X025AS	3
C4	300 pf 500v GI RDM15 FD301J03	1
C5	10 uf 20v Dickson D2R2GSB20K	1
C6, 3, 16, 18	2.2 uf 50v Dickson D2R2GSB50K	4
C7	Selected 500v GI	1
C9	.1 uf 12v Erie 5655-000 Y5F0 104M	1
C10, 11, 19, 21, 33, 37	.01 uf 100v Sprague TG-S10	6
C17	1 uf 25v Sprague 5C2310FX0250B3	1
C20	22 uf 25v M/E ET220X025A3	1
C22	.002 uf 1kv Sprague 5GA-D20	1
C26	1800 pf 500v GI RDM19 FDI82J03	1
C27	20 pf 500v GI RDM15 ED200J03	1
C28	620 pf 500v GI RDM15 FC621J03	1
C29, 30, 32, 34	.001 uf 1kv Sprague 5GA-D10	4
	(cont.)	

COMPUTER IMAGE MATERIAL LIST
SCANIMATE SYNC GENERATOR (cont.)
SM-105F
SCANIMATE

Drawing No.	Description	No. Req'd.
Q1	2N5457 Mot	1
Q2	2N5138 Fairchild	1
CI-00077	- HARDWARE - Card Ejector Scanbe S-200 Bracket, Switch CIC CI-00077 Nut, Hex 2-56 Screw 2-56 x 1/4" PHS Lockwasher Split Ring #21 Jack Cambion 450-3704-01-03 Plug Cambion 2871-1-0312	1 1 1 2 2 2 9 3

COMPUTER IMAGE MATERIAL LIST
SCANIMATE SYNC GENERATOR (cont.)
SM-105F
SCANIMATE

Drawing No.	Description	No. Req'd
	- RESISTORS -	
R16,59	6.2k 1/4w	2
R11,12,17,18,23, 33,56,59,46,58	5.1k 1/4w	10
R7,8	24k 1/4w	2
R9	200 ohm 1/4w	1
R10	20k 1/4w	1
R15	750 ohm 1/4w	1
R19,42	10k 1/4w	2
R20,21	1k 1/4w	2
R22,44	390 ohm 1/4w	3
R24,47	30k 1/4w	2
R25,45	1.6k 1/4w	2
R55	20k 3/4w Beckman 89PR20K	10% Var 1
R52	22k 1/4w	1
R54	3k 1/4w	1
R40	11k 1/4w	1
R41	2k 1/4w	1
R43	27k 1/4w	1
R60	110k 1/4w	1
R62	7.5k 1/4w	1
SI	- SWITCH - DPDT Alco MST-205N	1

(cont.)

COMPUTER IMAGE MATERIAL LIST
BLANKING SECTION CARD - SM-106C
CPU
SCANIMATE

COMPUTER IMAGE MATERIAL LIST
BLANKING SECTION CARD - SM-106C (cont.)
CPU
SCANIMATE

Drawing No.	Description	No. Req'd.	Drawing No.	Description	No. Req'd.
IC4,5	- INTEGRATED CIRCUITS - (cont.)		SM-106C	SM-106C Blanking Section Card Computer Image SM-106C	1
IC6,7	NC3029P Mot	2		- CAPACITORS -	
IC8	USB7711 393 Fairchild	2	C1	.1 ufd 100V Sprague 225P10491	1 Film
IC9	NC853P Mot	1	C2	3000 pf 500V GI RDM19 FD302J03	1 Mica
	NC1439G Not	1	C3,4,5,6,3,9	.01 ufd 100V Sprague TG-S10	6 Cer
	- RESISTORS -		C7	100 pf 500V GI RDM15 FDI01J03	1 Mica
	Resistors are fixed, composition $\pm$ 5% unless otherwise indicated		C10	.002 ufd 1kV Sprague 5GA-D20	1 Cer
R1	50k ohm 3/4W 10% Beckman 89PRS0K	1	C11,12,13	100 ufd 25V Amperex ET101X025A5	3 Elect
R2,3	5.1k ohm 1/4W	2		- DIODES -	
R4	10k ohm 3/4W 10% Beckman 89PR10K	1	D1	1N753 Dickson	1
R5,11,12,20	2.2k ohm 1/4W	4	D2	1N963 Dickson	1
R6,10,16,18,37	1k ohm 1/4W	5	D3,4	1N3064 Fairchild	2
R7,8,15,14	1k ohm 3/4W 10% Beckman 89PR1K	4		- INTEGRATED CIRCUIT -	
R9,55	4.3k ohm 1/4W	2	IC1	9602PC Fairchild	1
R15,17	360 ohm 1/4W	2	IC2	SN7410N TI	1
R19,31,32	20k ohm 1/4W	3	IC3	SN7420N TI	1
R21	390 ohm 1/2W	1		[cont.]	
R22	200 ohm 1/4W	1			
R23	120 ohm 1/2W	1			
R24,25	15k ohm 1/4W	2			

(cont.)

COMPUTER IMAGE MATERIAL LIST
ANIMATION OSCILLATOR CARD - SM-107A
CPU
SCANIMATE

COMPUTER IMAGE MATERIAL LIST
BLANKING SECTION CARD - SM-106C (cont.)
CPU
SCANIMATE

Drawing No.	Description	No. Req'd.	Drawing No.	Description	No. Req'd.
SM-107A	SM-107A Animation Oscillator Card Computer Image SM-107A	1	R26,27	- RESISTORS - (cont.) 10 ohm 1/4w	2
			R28	390 ohm 1/4w	1
C1,2,3	- CAPACITORS - 100 ufd 25v M/E ET101X025	3	R29	16k ohm 1/4w	1
C4,5,6,8,15	.002 ufd 1kv Sprague SGA-D20	5	R30	3.9k ohm 1/4w	1
C7	.01 100v Elmenco 10P-1-105	1	R34,35,36	5.1 ohm 1/2w	3
C9,10,11,12,13,14	.01 ufd 100v Sprague TC-S10	6	R57,38	5.6k ohm 1/4w	2
			S1	SPDT Alco NST-105D	1
D1,2,13,14,17,18, 19,20,21,22,23,24, 25,26	- DIODES - IN3064 Fairchild	14		- SWITCHES -	
D5,4	IN960 9.1v 400mw Zener	2			
D5,6	IN959 8.2v 400mw Zener	2	Q1	2N3644 Fairchild	1
D7,8	IN754 6.8v 400mw Zener	2	Q2	2N3569 Fairchild	1
D9,10	IN751 5.1v 400mw Zener	2		- HARDWARE -	
D11,12	IN746 3.3v 400mw Zener	2		Card Ejector Scanbe S-200	1
D15,16	IN961 10v 400mw Zener	2	CI-00077	Bracket, Switch Computer Image CI-00077	1
	- INTEGRATED CIRCUITS -			Nut, hex, 2-56	2
IC1,2,3,4,5	MC1439G Motorola	5		Screw, 2-56 x 1/4 inch, PHS Phillips	2
				Lockwasher, split ring #2	2

(cont.)

COMPUTER IMAGE MATERIAL LIST
ANIMATION OSCILLATOR CARD - SM-107A (cont.)
CPU
SCANIMATE

Drawing No.	Description	No. Req'd.	No. Req'd.
	- RESISTORS - (cont.)		
R31	15k ohm 1/4w	1	
R32	47k ohm 1/4w	1	
R33	100k ohm 1/4w	1	
R34	430k ohm 1/4w	1	
R35	16k ohm 1/4w	1	
R41, 46	1.2k ohm 1/4w	2	
R42, 45	5.6k ohm 1/4w	2	
R57, 58	3k ohm 1/4w	2	
R59, 60, 70, 71, 72,	2k ohm 1/4w	5	
R63, 69	39 ohm 1/4w	2	
R74	7.5k ohm 1/4w	1	
	- TRANSISTORS -		
Q1, 2, 3, 4	2N4342 Fairchild	4	
Q5, 7, 11	2N3569 Fairchild	3	
Q6, 8, 12	2N3644 Fairchild	3	
Q9, 10, 15, 16	2N5153 Fairchild	4	
Q15, 14	MEM517C GI	2	
Q17	2N5158 Fairchild	1	
	- RESISTORS -		
	Resistors are fixed composition $\pm$ 5% unless otherwise specified		
IC6, 7	1K ohm 3/4w 10% Var Beckman 89PR1K	2	
IC8	20K ohm 3/4w 10% Var Beckman 89PR20K	1	
	5.1 ohm 1/2w 3		
	390 ohm 1/4w 7		
	10k ohm 1/8w 1% Prec 2		
	1k ohm 1/4w 8		
	1meg ohm 1/4w 1		
	5.1k ohm 1/4w 6		
	49.9k ohm 1/8w 1% Prec 2		
	11k ohm 1/4w 4		
	10k ohm 1/4w 10		
	15k ohm 1/4w 6		
	10 ohm 1/4w 4		
	1.6k ohm 1/4w 3		
	(cont.)		

COMPUTER IMAGE MATERIAL LIST
SQUARE ROOTER CARD - SM-120B
CPU
SCANIMATE

Drawing No.	Description	No. Req'd.
SM-120B	SM-120B Square Rooter Card Computer Image SM-120B	1
C1,2	100 ufd 25v Amperex ET101X025A5	2
C3,4,5,6,8,9,14, 15	.01 ufd 100v Sprague TG-S10	8
C7,10,	.002 ufd 1kv Sprague 5GA-D20	2
D1,2,3,4,6,7	IN3064 Fairchild	6
IC1,3	HA2-2515-5 Harris	2
IC2,4,	MCL439G Mot	2
R1,2	5.1 ohm 1/2w	2
R3,4,27	10k ohm 1/8w	3
R5	560k ohm 1/4w	1
R6,14,	10k ohm 3/4w Beckman 89PRIOK	2
R7	1k ohm 1/4w	1
	(cont.)	

COMPUTER IMAGE MATERIAL LIST
SIZE MULTIPLIER CARD - SM-118A
CPU
SCANIMATE

Drawing No.	Description	No. Req'd.
SM-118A	SM-118A Size Multiplier Card Computer Image SM-118A	1
C1,2	100 ufd 25v Amperex ET101X025A5	2
D1,2,3,4,5,6,7,8, 9,10	IN3064 Fairchild	10
IC1,2,3,4,5,6	HA2-2515-5 Harris	6
R1,2	10 ohm 1/2w	2
R3,18	1k ohm 1/4w	2
R4,15	20k ohm 1/8w	2
R5,7,10,11,12,14, 16,19,21,23,24,26	10k ohm 1/8w	12
R6,15	560k ohm 1/4w	2
R8,9,17	10k ohm 3/4w Beckman 89PRIOK	3
R20	51 ohm 1/4w	1
R22	1 megohm 1/4w	1
R25	10k ohm 1/4w	1
	(cont.)	

COMPUTER IMAGE MATERIAL LIST
ANIMATED ADDER AND DIFFERENTIATOR CARD - SM-134B (cont.)
CPU
SCANIMATE

COMPUTER IMAGE MATERIAL LIST
SQUARE ROOTER CARD - SM-120B (cont.)
CPU
SCANIMATE

Drawing No.	Description	No. Req'd.	Drawing No.	Description	No. Req'd.
- RESISTORS -					
Resistors are fixed, composition $\pm 5\%$ unless otherwise indicated					
R1,2	10 ohm 1/2w	2	R5,	20k ohm 1/4w	1
R3,4,5,6,28,29,30,31	10k ohm 1/8w 1% Prec	8	R9	30k ohm 1/4w	1
R7,32	10k ohm 1/4w	2	R10,16,	390 ohm 1/4w	2
R3,33	390 ohm 1/4w	2	R11,13,28	10k ohm 1/4w	3
R9,10,34,35	15k ohm 1/4w	4	R12	15k ohm 1/4w	1
R11,12,15,22,23,36,37	10 ohm 1/4w	7	R13	7.5k ohm 1/4w	1
R13,38	5k ohm 3/4w Beckman 89PR5K	2	R15	820k ohm 1/4w	1
R14,39	5.1k ohm 1/4w	2	R17	4.99k ohm 1/8w 1% Prec	1
R16,42	10k ohm 3/4w Beckman 89PRI0K	2	R29	75 ohm 1/4w	1
R17	130k ohm 1/4w	1	- HARDWARE -		
R18,41	150 ohm 1/4w	2	Card Ejector		
R19,43	100k ohm 1/4w	2	Scanbe S-200		
R20,44	300 ohm 1/4w	2			
R21,45	160k ohm 1/4w	2			
R24,25	4.7k ohm 1/4w	2			
R26,27	3k ohm 1/4w	2			
R40	200k ohm 1/4w	1			
R46	33k ohm 1/4w	1			
R47	20k ohm 1/8w 1% Prec	1			
(cont.)					

(cont.)

COMPUTER IMAGE MATERIAL LIST
ANIMATED ADDER AND DIFFERENTIATOR CARD - SM-134B
CPU
SCANIMATE

COMPUTER IMAGE MATERIAL LIST
ANIMATED ADDER AND DIFFERENTIATOR CARD - SM-134B (cont.)
CPU
SCANIMATE

Drawing No.	Description	No. Req'd.
SM-134B	- CIRCUIT BOARD - Anim. Adder & Diff. Card Computer Image SM-134B	1
C1,2	- CAPACITORS - 100 ufd 25V Amperex ET101X025A5	2
C3,4,7,8,9,11,14,15	.01 ufd 100V Sprague TG-S10	8
C5,10	.002 ufd 1kV Sprague SGA-D20	2
C6	.1 ufd 100V Sprague 22510491WD3	1
C12	130 pfd 500V GI RDM15 FD131J03	1
C15	5 pf 500V GI RDM15CD050J03	1
C16	1200 pf 500V GI RDM19 FD121J03	1
C17	100 pf 500V GI RDM15 FD101J03	1
C18	220 pf 500V GI RDM15 FD221J03	1
C19	33 pfd 500V GI RDM15ED350J03	1
D1,2,3,4,5,6	- DIODES - 1N3064 Fairchild	6
IC1,3	- INTEGRATED CIRCUITS - NCL459G Mot	2
IC2,4	HA2-251S-5 Harris	2

(cont.)

Drawing No.	Description	No. Req'd.
S1	- SWITCHES - DPDT Alco MST-205N	1
S2	SPDT Alco MST-105D	1
Q1,3,5	- TRANSISTORS - 2N3569 Fairchild	3
Q2,4,6	2N3644 Fairchild	3
C11-00077	- HARDWARE - Bracket, Switch Computer Image C1-00077 Card Ejector Scanbe S-200 Lockwasher, Split ring, #2 Nut, 2-56, hex Screw, 2-56 x 1/4 inch, PHS	2 1 4 4 4

COMPUTER IMAGE MATERIAL LIST
X ANIMATION & DIFFERENTIATOR CARD - SM-135 (cont.)
CPU
SCANIMATE

Drawing No.	Description	No. Req'd.
R7,8	- RESISTORS - (cont.) 15k ohm 1/4w	2
R9,10,11,25,26	10 ohm 1/4w	5
R12	150 ohm 1/4w	1
R13	160k ohm 1/4w	1
R14,15	4.7k ohm 1/4w	2
R16,17	3k ohm 1/4w	2
R23	100 ohm 3/4w 10% Beckman 89PR100	1
R24	20k ohm 1/8w 1% Prec	1
Q1,3	- TRANSISTORS - 2N3569 Fairchild	2
Q2,4	2N3644 Fairchild	2
	- HARDWARE -	
	Card Ejector	1
	Scanbe S-200	
	Swage Terminal PNP ID4-6B	1

COMPUTER IMAGE MATERIAL LIST
X ANIMATION & DIFFERENTIATOR CARD - SM-135
CPU
SCANIMATE

Drawing No.	Description	No. Req'd
SM-135	- CIRCUIT BOARD - SM-135 X Anim. & Differ. Card Computer Image SM-135	1
C1,2	- CAPACITORS - 100 ufd 25V Ampere ET101X025A5	2
C3,4,7,8,9,11	.01 ufd 100v Sprague TG-S10	6
C5,10	.002 ufd 1kv Sprague 5GA-D20	2
C6	.1 ufd 100v Elmenco LDP-2-104	1
D1,2,3,4,5,6	- DIODES - 1N3064 Fairchild	6
IC1,3	- INTEGRATED CIRCUIT - MC1439G Not	2
IC2	HA2-2515-5 Harris	1
	- RESISTORS -	
	Resistors are fixed, composition + 5% unless otherwise indicated	
R1,2	10 ohm 1/2w	2
R3,4,18,19,22	10k ohm 1/8w 1% Prec	5
R5,21	390 ohm 1/4w	2
R6,20	10k ohm 1/4w	2

(cont.)

COMPUTER IMAGE MATERIAL LIST
SIGNAL ROTATION CARD - SM-136A (cont.)
CPU
SCANIMATE

Drawing No.	Description	No. Requ'd
- RESISTORS - (cont.)		
R34,59	330k ohm 1/4w	2
R35,60,89,105	20k ohm 3/4w 10%	4
	Beckman 89PR20K	
R36,58,87,107	84.5k ohm 1/8w 1%	4
R38,56	8.66k ohm 1/8w 1%	2
R35,108,113,114	45.3k ohm 1/8w 1%	4
R35,109	82.5k ohm 1/8w 1%	2
R33,106	1.2 megohm 1/4w	2
R11,112	20k ohm 1/8w 1%	2
- TRANSISTORS -		
Q1	2N5134 Fairchild	1
Q2,3	2N4351 Mot	2
- HARDWARE -		
	Card Ejector Scanbe S-200	1
	Socket Cinch Jones 14-DIP	4
	Jack Cambion 3704-1-03	24

COMPUTER IMAGE MATERIAL LIST
SIGNAL ROTATION CARD - SM-136A
CPU
SCANIMATE

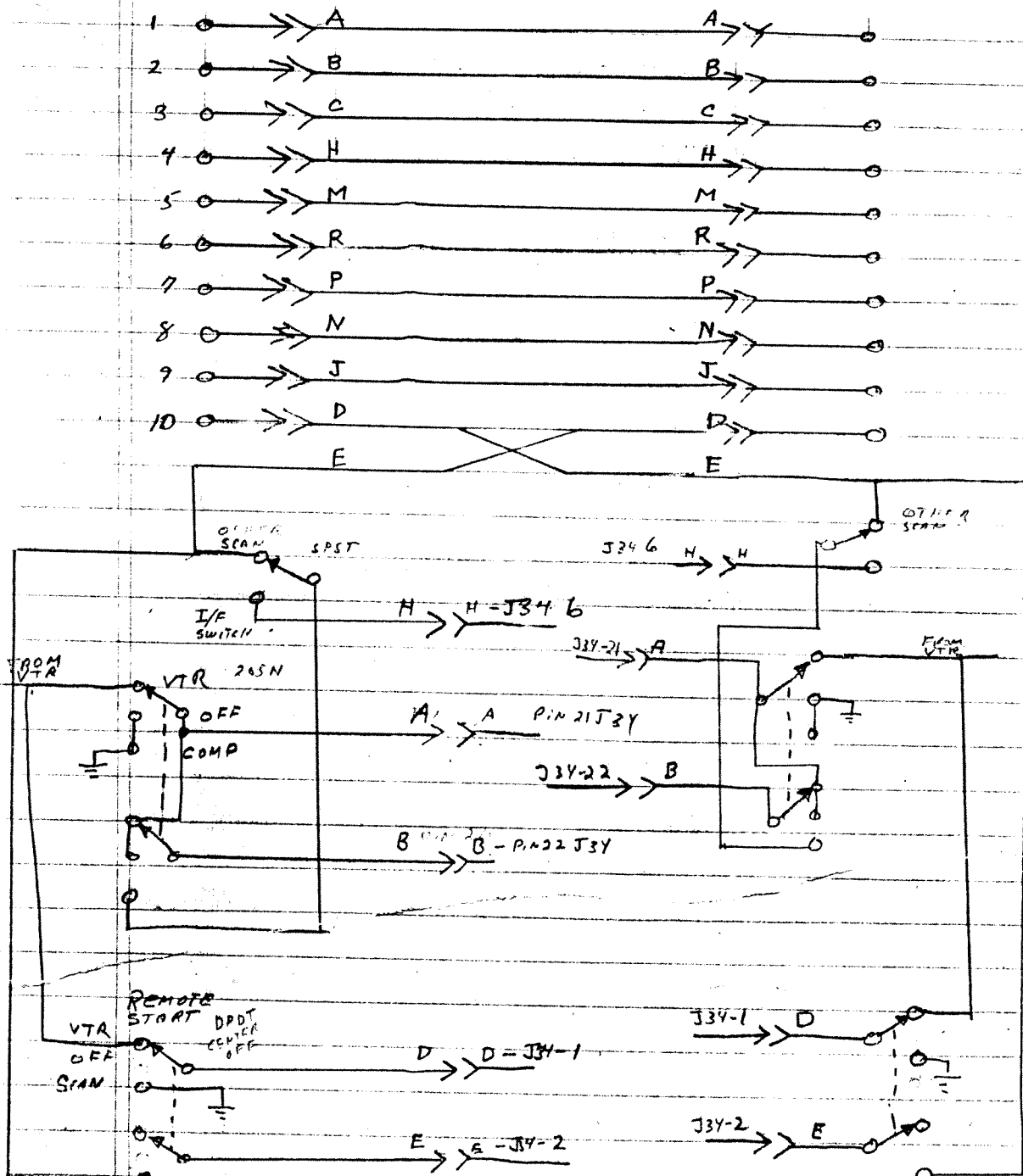
Drawing No.	Description	No. Requ'd
- CIRCUIT BOARD -		
SM-136A	SM-136A Signal Rotation Card Computer Image SM-136A	1
- CAPACITORS -		
C1,2,3	100 ufd 25V Elect	3
	Amperex ET101X025A5	
C4,5	.001 ufd 1 kv Cer	2
	Sprague SGA-D10	
C6,13,20,23,	5 pf 500V Mica	4
	GI RDM15 CD050D03	
C7,8,9,10,14,15,16,17,21,22,24,25,26,27,31,32,33,34,38,39	.01 ufd 100V Cer	20
	Sprague TG-S20	
C11,12,18,19,23,29,35,36	1.0 ufd 25V Cer	8
	Sprague 5C23105X0250B3	
- DIODES -		
D1,2	1N3064 Fairchild	2
- INTEGRATED CIRCUITS -		
IC1	SN7400N TI	1
IC2	DM8520N NSC	1
IC3	ICL8007CTV Intensil	1
IC4,6,9,11	MC1595L Mot	4

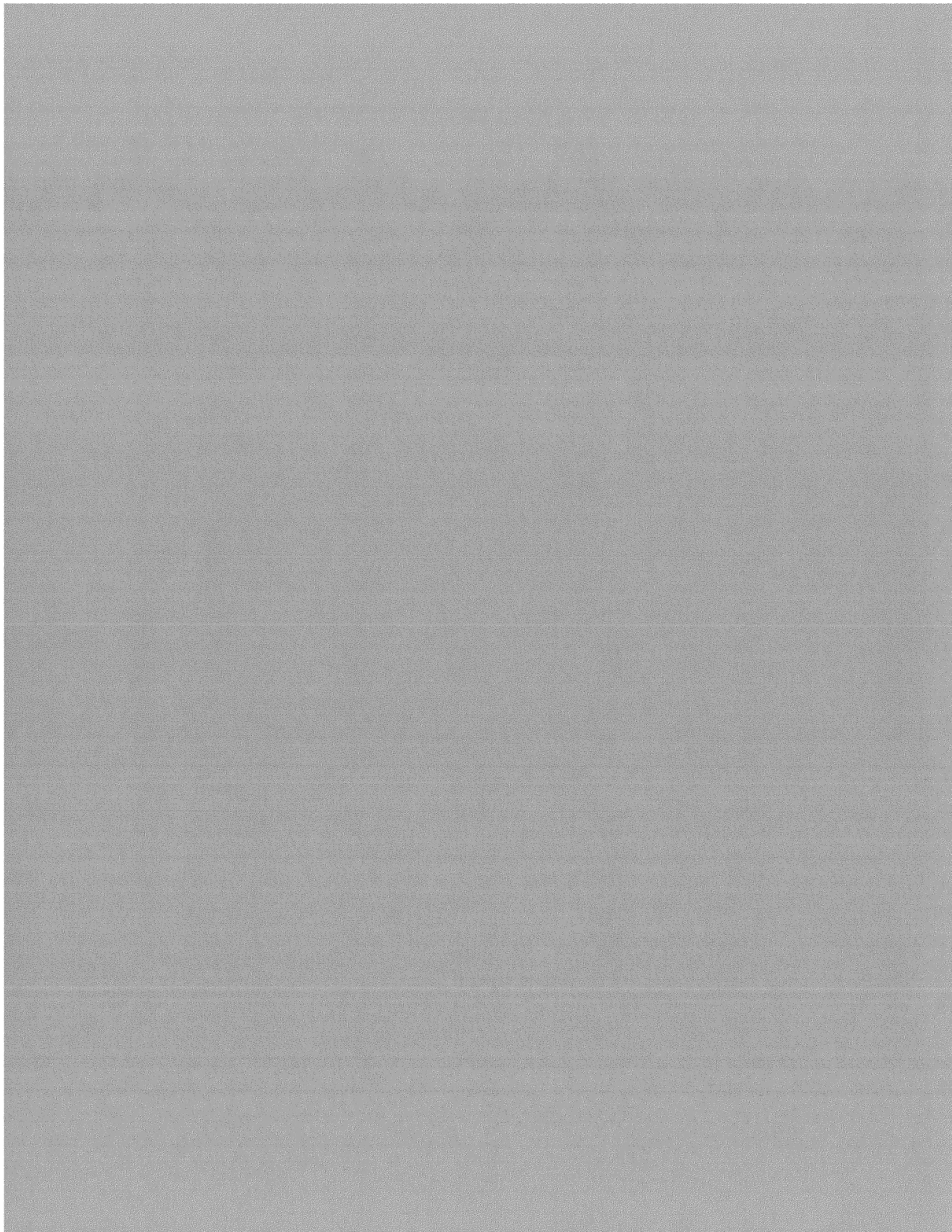
(cont.)

COMPUTER IMAGE MATERIAL LIST
SIGNAL ROTATION CARD - SM-136AE(cont.)
CPU
SCANIMATE

(cont.)

CONNECTING TWO LA COMPUTERS





COMPUTER IMAGE MATERIAL LIST
 CIRCUIT BREAKER PANEL - C1-00057
 RACK #1
 SCANIMATE

Drawing No.	Description	No. Req'd.
	- ELECTRICAL -	
SM-137	SM-137 50/60 Hz Reference Bd Computer Image	1
	Circuit Breaker Wood Elect P/N 518-215-101	1
	Light Alco BND-2R	1
	Power Supply ACDC OEM5N10-1	1
	Power Supply ACDC OEM15N5-1	2
	- HARDWARE -	
	Panel Stantron P5	1
	Screw, 6-32 x 1/4 inch, PHS	4
	Lockwasher, internal, #6	4
	Screw, 4-40 x 1/4 inch, PHS	8
	Lockwasher, internal, #4	8
	Screw, 8 x 3/8 inch, Phillips, Truss, TSA	6
	Lockwasher, internal, #8	24
	Spacer, Threaded, 4-40 x 3/8 Inch H.H. Smith 2371	4

ROTATION CONTROLLER

THEORY OF OPERATION

The system is designed to supply voltages representing the sine and cosine of any angle which may then be used to rotate the Scanimate raster when fed to J11-signal rotation card. A maximum of five sections may be controlled and each of the sections may have different angles. The sine and cosine values are updated at the beginning of each section and remain unchanged throughout the section length time.

The heart of the system is a read-only memory (ROM). The ROM is a 128 x 8 bit memory containing the Sine between 0° and 90° . It is organized to have 128 distinct memory locations over this interval giving a resolution of $90^\circ/128 = 0.7^\circ$. Each angle is accurate to 8 bits or 1 part in 256 ($\pm 0.4\%$ of true value).

SINE WAVE GENERATION

To understand the system, it will be helpful to examine a simple system which will generate a sine wave over the interval of 0° to 360° .

Since all calculations are digital, a digital to analog (D/A) Converter is used as a transducer. This D/A requires nine bits of information with the most significant bit (MSB) controlling the sign or polarity of the output. All bits equal to zero will give a -10 volt output. All bits equal to one will give a +10 volt output. With the MSB a one and with all others a zero (100000000), the output will be approximately zero volts.

Referring to figures 1 and 2, assume the following initial conditions:

1. Clock disabled.
2. 7 bit up-down counter reset to zero.
3. FF1 set - (count up state)
4. FF2 set - (Force D/A to go positive and no data complement).

The 7 bit up/down counter supplies a count of 0 to 127 corresponding to an angle of 0° to 90° to the ROM.

The ROM's output is an 8 bit binary number representing the sine of the angle. This data is passed through a data complement network which is controlled by the MSB. If the MSB is a one, no data change will occur. If the MSB is a zero then all 8 bits will be complemented. The data along with the MSB is passed to the D/A which was discussed earlier.

When the clock is enabled, the up-down counter will start counting up toward 127 (90°) and the ROM output is passed directly to the D/A which in turn generates an analog voltage between zero and plus ten volts, representing the first quadrant of a sine wave.

When 90° is reached, the output of the 90° gate goes true and resets FF1, forcing a countdown state.

With further clock pulses now being applied to the countdown input, the up/dn counter starts counting in reverse from 127 to 0 and the ROM output goes back down toward zero. The output is again passed directly to the D/A, generating the voltage for the second quadrant.

When a count of zero is detected, corresponding to 0° , the 0° gate becomes true and sets FF1 (forcing a count up) and FF2 being zero forces the data complement network to complement all 8 bits of data passing between the ROM and D/A.

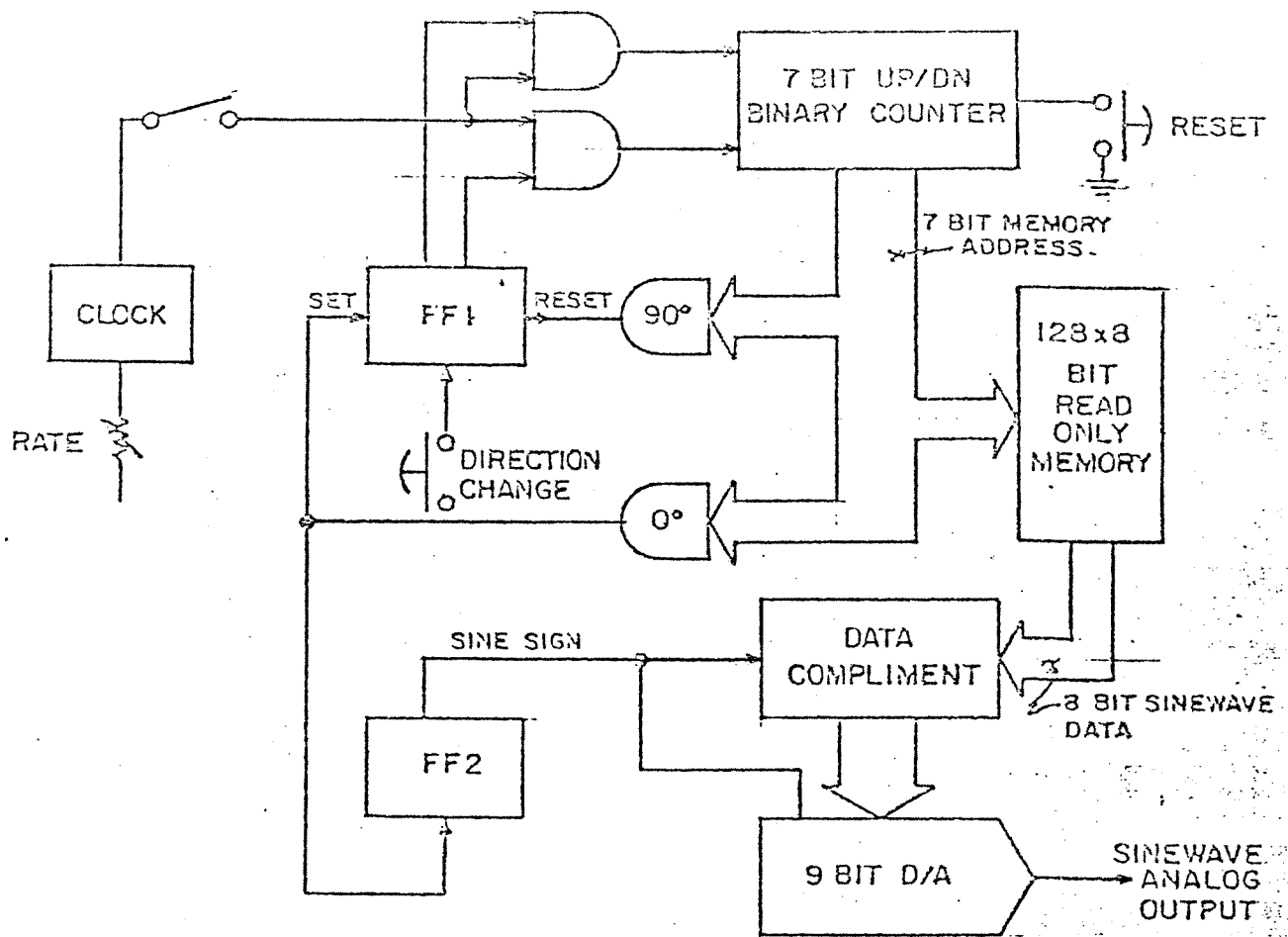


FIGURE 1

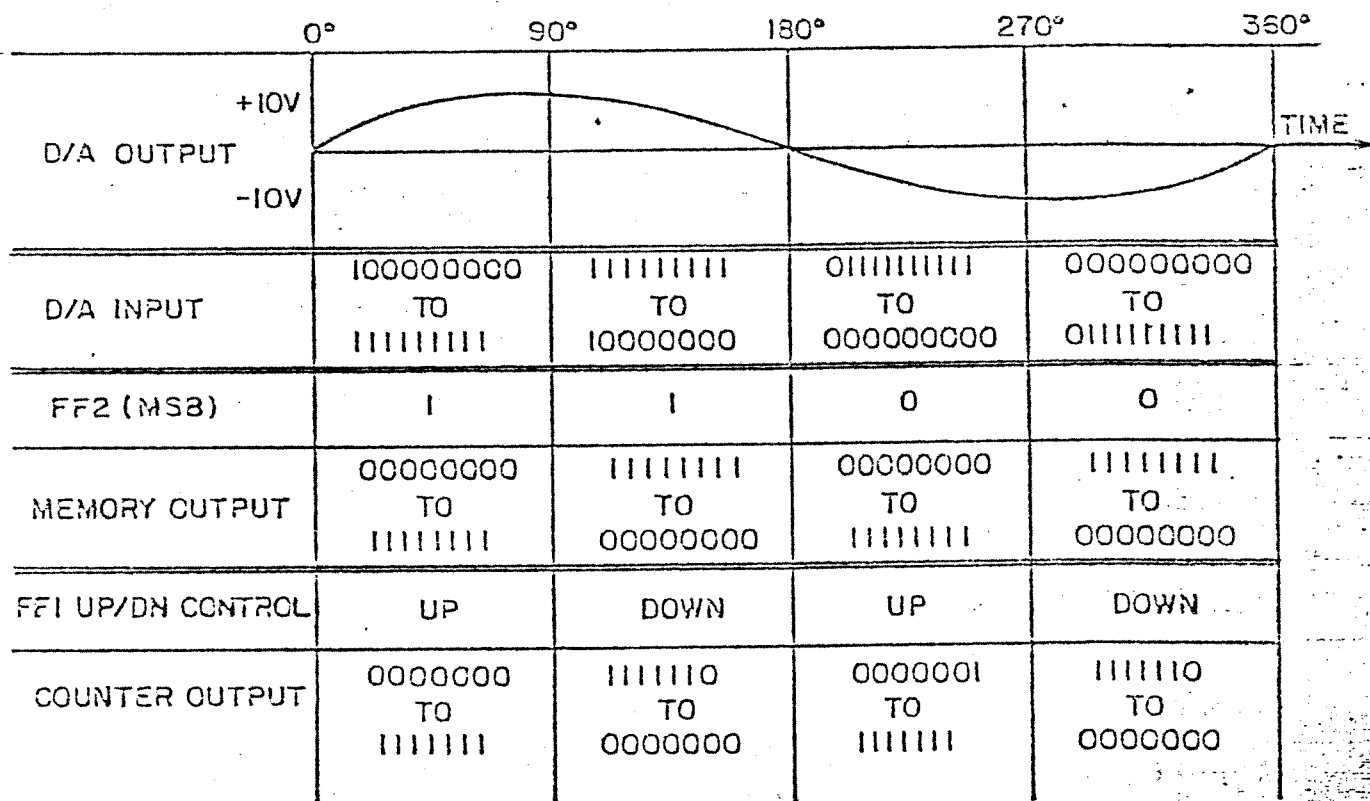
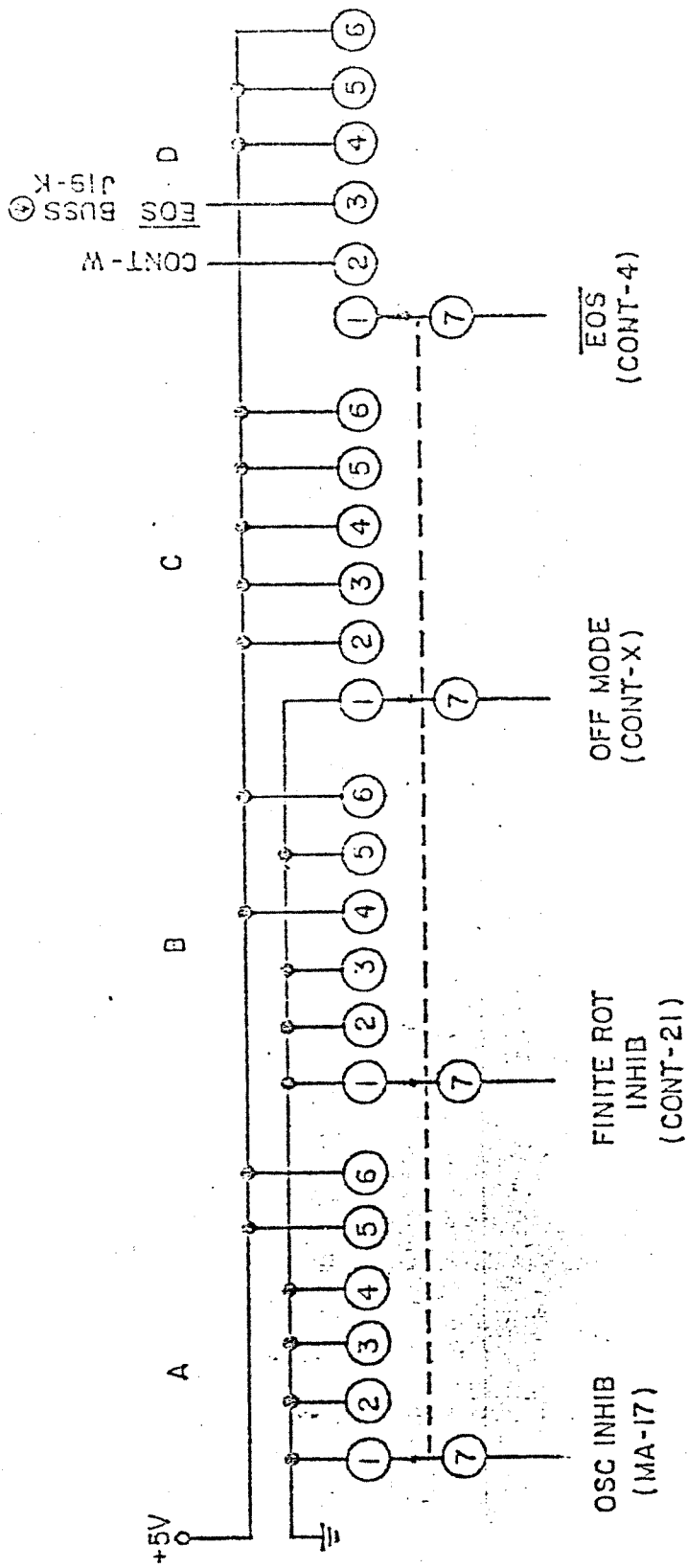


FIGURE 2



- POSITION
1. OFF
 2. INIT. TO FINAL
 3. ROTATION SEQUENCE
 4. FINITE OSCILLATION
 5. CONTINUOUS ROTATION
 6. FINITE OSCILLATION

	A7	B7	C7	D2	D3	D7
S22 SECTION 1	J3-17	J4-21	J4-X	J4-W	J19-K	J4-4
S23 SECTION 2	J5-17	J6-21	J6-X	J6-W	S22-D3	J6-4
S24 SECTION 3	J7-17	J8-21	J8-X	J8-W	S23-D3	J8-4
S25 SECTION 4	J9-17	J10-21	J10-X	J10-W	S24-D3	J10-4
S26 SECTION 5	J11-17	J12-21	J12-X	J12-W	S25-D3	J12-4

4 POLE 6 POSITION
 ROTARY (NON-SHORTING)
 JRC # 7216
 S22 THRU S26

MODE SWITCH

The up/dn counter now counts up toward 127. The ROM output is identical to quadrant one, however the D/A converter now swings between zero and minus ten volts due to all 9 data bits being complemented, generating the voltage for the third quadrant. When a count of 127 (90°) is reached, FF1 is complemented causing a count down situation and the D/A output generates the fourth quadrant voltage. When the count reaches zero FF2 is complemented and FF1 is set. We are back to our original conditions - after having generated one complete cycle of a sine wave.

The frequency of the sine wave in all cases is controlled by the rate of the clock.

COSINE WAVE GENERATION

The organization of the ROM is such that if the memory address represents an angle for the sine wave and if this address is complemented, the ROM's output will be the number representing the cosine of the original angle. This is identical to accessing the ROM from top to bottom (90° to 0°) instead of from bottom to top (0° to 90°) as for the sine wave, over the first quadrant.

ROTATION CONTROLLER

OPERATING PROCEDURE:

The Rotation Controller provides a means by which the Scaumate raster may be rotated about the "Z", or depth axis. The system may be used for animation sequences, or simply for making best use of raster space. The raster space may be best used by designing the artwork with all sections laid out horizontally, and then rotated until the proper position is obtained. This means that a long vertical piece of artwork may be placed on the cell horizontally requiring only a few horizontal lines instead of the whole raster.

The Controller has the capability of rotating up to five sections. Each section may be controlled independently. The rate of rotation, direction (CW or CCW), or mode of operation of each section may be different for each section.

The rotation rate controls are a ten turn pot, X1/previous section/X10 rate switch and manual button. The pot changes the rate approximately by a ratio of 10 to 1. Minimum is CCW, maximum is CW. The three position rate switch, X1/previous section/X10, multiplies the rate by a factor of ten when in the X10 position. In the center position, the rate from the previous section is used. This allows the operator to rotate more than one section at the same rate.

The "Manual" button may be used to rotate the raster manually. The raster will rotate about 0.7° each time the button is pressed. The "Manual" button will work only when the "START/STOP" switch is in the "STOP" position.

The "DIRECTION REVERSE" button changes the direction of rotation. It may be pressed at any time. The raster may be rotating or stopped. If it is rotating, it will change directions immediately. If the raster is stopped, it will change the direction from the way it was previously rotating.

The "SECTION SELECTOR" switch selects the section that the "INITIAL ANGLE LOAD", "FINAL ANGLE LOAD", "SECTION RESET", and "NUMBER OF REVOLUTION LOAD" will control. The section that is being set up must be selected by this switch.

The "INITIAL ANGLE LOAD" button will load the section angle and direction of rotation into a storage register. The raster section will rotate to this angle whenever the Scanimate "INITIAL/FINAL" switch is moved from final to initial. The angle is stored when the button is released. The "SECTION SELECTOR" switch must be used with this button.

The "FINAL ANGLE LOAD" button is used to store a final angle for use in the "INITIAL/FINAL" mode, the "FINITE ROTATION" mode, the "CONTINUOUS OSCILLATION" mode and the "FINITE OSCILLATION" mode. The "SECTION SELECTOR" switch must be used with this button.

Do not attempt to load exactly 0° or 90° as an initial or final angle.

The "SECTION RESET" button is used to set the section that is selected by the "SECTION SELECTOR" switch to zero degrees, the raster rotation direction to "CW".

The "NUMBER OF REVOLUTION LOAD" button is used to load the number of revolutions for use in the "FINITE" modes, one revolution for each time the button is pushed. The "SECTION SELECTOR" switch

must be used with this button. The maximum number of revolutions that may be stored is 15. If the number of revolutions is to be increased it may be done at any time by simply pushing the button once for each additional rotation desired. If the number is to be decreased, the counter must be reset with the "SECTION RESET" button. Then the new count is loaded.

The "INITIAL ANGLE SET" button is used to set all sections to their preset initial angles and directions, and reset the revolution counter. This button is used to set up initial conditions for a sequence after everything else has been set up. It will set all sections to the angle that is stored in each initial angle storage register even if the mode switch is in the "OFF" mode.

The "AXIS" or "CENTER OF ROTATION" is controlled by the horizontal and vertical axis commutators. The "AXIS" is the point about which the section rotates. It may be anywhere inside the section, or anywhere outside the section. The axis position may be moved horizontally or vertically when the raster is at zero degrees. However, when the raster is rotated, the horizontal and vertical axis rotate with the raster. This has the affect that when the raster is at 90° or 270° the horizontal and vertical commutators have opposite functions. This means that the vertical commutator controls the horizontal axis and vice-versa.

Modes of operation:

There are six modes of operation that may be used. These modes and their function are:

"OFF"

In this mode the rate clock is disabled and the section will remain at the angle that is loaded into the initial angle storage register.

This mode may be used when rotation is not required for animation, but to locate a section at an angle other than the angle of the artwork. It must be remembered that the angle that is to be held must be stored in the initial angle storage register. If it is not, the angle will change when the Scanimate initial/final switch is changed from final to initial.

"INITIAL TO FINAL"

In this mode the section will rotate from an initial angle to a final angle in the direction that is preset into the initial and final angle storage registers. The initial and final angles must not be equal. This mode is useful where the total angular change required is less than 360° .

"ROTATION SEQUENCE"

This mode synchronizes the rotation to the sequence ramp in Scanimate. When the initial/final switch is actuated the section will start rotating from a stored initial angle. The final angle is the angle at which the raster happens to be when the electronic switch in Scanimate cuts in. In other words the end of the sequence ramp.

The rotation in this mode may be more than 360° , and is limited by the maximum rotation rate and the length of the sequence ramp. However, with fast rotation and long sequence ramps, the final angle may vary considerably each time the ramp is generated due to tolerances in both the sequence ramp generator and the electronic switch threshold.

"FINITE ROTATION"

This mode provides rotation from a stored initial angle, to the same initial angle, through 360° , a finite number of times, with a maximum number of 15. The number of rotations is preset with the "NUMBER OF REVOLUTIONS" button.

When setting up this mode, the final angle storage register must have an angle loaded into it that is not equal to the initial angle. This stored angle is used for control of the associated internal circuitry and is absolutely necessary for proper operation in this mode.

Another thing to remember about this mode is that the raster will stop at the initial position after the proper number of rotations, (i.e.) one revolution is defined as rotation from an initial position thru 360° to initial position.

After setting initial angle and the final angle, press "SECTION RESET" to reset the revolution counter to zero. Then press "INITIAL ANGLE SET" to set the raster to the initial angle. The number of revolutions may now be stored by pressing the revolution load button once for each revolution desired. This procedure also applies to the finite oscillation mode to be described later.

"CONTINUOUS OSCILLATION"

Oscillation is defined as: rotation from a preset initial angle to a preset final angle, change direction back to the preset initial angle and then repeat the process until the initial/final switch on Scanimate is reset to initial. The oscillation as defined must be less than 360°.

When setting up the oscillation, the procedure works best if the final angle is stored first. The angle may be loaded while the raster is moving or the raster may be stopped first. If the angle is stored while moving, keep in mind that the angle is stored when the "LOAD" button is released not when it is depressed, so the switch must be released immediately. The raster rotation direction will change automatically and will start back in the opposite direction. The initial angle is then stored in the same manner.

The important thing to remember here is that the raster must be rotating in the direction it will be coming from in the normal operation of the oscillation mode.

"FINITE OSCILLATION"

This mode is set up the same as continuous oscillation. After the angles are stored, the revolution counter must be loaded as described for finite rotation above.

"EXTERNAL CONTROL"

In all of the above modes of operation, the start and stop of each section can be externally controlled by applying a signal of either ground (stop) or plus 5V (start) to the proper locations on the Raster Segment Blanking patch panel.

The initial/final switch on Scanimate, when set to initial, will reset each section to the initial angle. The sections will not rotate when the initial/final switch is set to final on Scanimate as long as the external input of each section is at ground level. When the external input of each section is at plus 5V the section will rotate through its cycle. At any time the external input is grounded the rotation will stop even if its cycle is not complete.

This external input allows the operator to rotate each section at a different time.

ROTATION CONTROLLER SYSTEM OPERATION

GENERAL

The following paragraphs outline the principles of operation of the Scanimate rotation controller at the block diagram level.

Reference should be made to The Theory of Operation section and the block diagram when necessary.

The front panel controls are organized to allow each section to have a different operating mode and rate of rotation if desired. Each section has its own rate control, direction reverse pushbutton, start-stop switch, manual pushbutton and mode switch. The initial and final angle load, section reset and number of revolutions load pushbuttons affect only the section selected via the section selector switch. The initial angle set pushbutton is common to all five sections.

Each section has its own rate clock, control card and memory address card. The memory card and D/A converter card are used by all sections at the appropriate section time. The sequence control card contains pulse and level shaping circuits to interface with the initial-final switch and end of sequence signals from Scanimate.

A description of the operation will be confined to rotation of a single section. The other sections operate in an identical manner.

ROTATION CONTROLLER DATA FLOW

Clock pulses from the rate clock are passed through a clock gating circuit which allows the clock pulses to be gated on or off by various signals, depending upon the mode switch.

The gated clock pulses are fed to an up-down counter which is under control of the up-down flip-flop. The up-down flip-flop determines the direction of rotation.

The up-down counter is a 7 bit counter counting between 0 and 127. The 7 bit output (memory address) along with the sign or polarity flip-flops, define the current angle of rotation of the raster.

This information is collector or'd with the other sections current angles, however only one section at a time is active. The section enable signals determine which data is to be used.

The 7 bit memory address is stored into a memory address storage register at section change time. The address is passed straight through the address complementing gate to the ROM where the value for the sine is "looked up." The 8 bit sine data along with the sine sign or polarity is strobed into the sine storage register and the 9 bit D/A then converts this information to an analog voltage between ± 10 volts. The up-date sine strobe then generates the update cosine strobe. This pulse complements or inverts the 7 bit memory address. The ROM then "looks up" the 8 bit cosine value, and this data along with the cosine sign is passed to the cosine D/A where it is converted.

Also included is circuitry to store initial and final angles and compare circuitry to generate a pulse when the current angle equals the stored initial or final angles. These initial and final compare signals are for reversing direction in the oscillation modes. The final compare will also stop the clock in the initial to final mode. The initial angle storage is used to preset the circuitry to an initial angle and the initial compare is used to count the num-

ber of revolutions or oscillations in the "finite" modes. Two 4 bit counters and a comparator are used in the finite oscillation and rotation modes. One of the counters stores the number of cycles desired and the other counts the number of cycles that occur. When these are equal, the compare circuitry will stop the clock.

DESCRIPTION OF OPERATION

The rate clock cards, J13 and J14, contain voltage controlled oscillators (V.C.O.) and a digital divider network. Each of the V.C.O.'s have a control line brought to the patch panel located on the segment blanking controller. When the control line is grounded the V.C.O. will stop oscillating.

The rate may be varied by the rate control potentiometers (pot) located on the front panel. The V.C.O. output (X10) or the (V.C.O. output)/10 (X1) may be selected by the front panel range switches. J13 contains four V.C.O.'s for sections one through four and J-14 contains the V.C.O. for section five.

The V.C.O. output for section one goes to the control card J-4 where it is under control of the clock gate circuitry. The start-stop switch selects either the V.C.O. clock (start) or the manual pushbutton clock (stop).

The manual pushbutton, is useful for setting up the initial and final angles and for calibration purposes. When the mode switch is "OFF", both clocks will be disabled.

Another input to the clock gate circuitry is the initial-final signal from J15. When the Scanimate initial-final switch is thrown from final to initial the V.C.O. clock is disabled. When it is thrown from initial to final, the V.C.O. clock is en-

abled. This action is similar to the start-stop switch.

After the V.C.O. clock is enabled, thereby causing rotation, the rotation may be stopped by various signals:

1. Zero volt level applied to the external V.C.O. control line.
2. Start-stop switch being moved to stop.
3. Initial/final switch being moved to initial.
4. End of sequence applied through mode switch A (Rotation sequence mode).
5. Final compare applied through mode switch A (Initial to final mode).
6. Number of revolutions compare applied through mode switch B (Finite modes).

The description of operation will now deal with the generation of a digital representation of the angle of rotation, the direction of rotation and the polarity of the sine or cosine signal.

The clock signal from the clock gate is applied to the clock steering network located on the memory address card. This network, under control of the up-down flip-flop, then applied the clock signal to either the count up or count down inputs on the up-down binary counter. The counter is a 7 bit counter counting between 0 and 127. It is capable of being reset to 0 or being preset to the contents of the initial count storage register. The 7 bit counter output, which represents an angle, will eventually be applied to the read only memory (ROM) as a memory address, via the memory address gate.

The output also goes to the initial and final count storage registers, the initial and final count comparators and to the decode 0^0 and decode 90^0 gates. Decode 0^0 corresponds to a count of

all zeros and decode 90° corresponds to a count of all ones. The decode 0° gate is used to determine the sign of the sine. Each time 0° is encountered, the polarity of the sine wave will be changed, by changing the status of the sine sign flip-flop on the control card. This signal also sets the up-down flip-flop, forcing a count up state.

The decode 90° gate is used to determine the sign of the cosine. Each time 90° is encountered the cosine sign flip-flop will change states. This signal also resets the up-down flip-flop forcing a count down state.

The three status flip-flops (up-down, sine and cosine sign) will all be set, the up-down counter will be reset, and the number of revolutions counter will be reset whenever the section reset is pressed. This corresponds to an angle of 0° .

The three status flip-flops and the up-down counter will be preset to the contents of the initial status and count storage registers whenever the initial angle set is pressed or whenever the initial-final switch on Scanimate is thrown from final to initial.

The initial status and count storage registers will be loaded whenever the initial angle load pushbutton is pressed then released. The output of the three status flip-flops will be stored in the initial status storage and the 7 bit counter output will be stored in the initial count storage register. It makes no difference whether the raster is rotating or standing still when the initial angle pushbutton is pressed. It should be observed however that the direction (up-down flip-flop) is also stored.

As an example: Section reset is pressed and then initial angle load is pressed. The initial angle stored will be 0^0 and the initial direction will be counter clockwise (CCW). When the initial angle set pushbutton is pressed or the initial-final switch is thrown to initial, a pulse is generated (preset initial), which presets the up-down counter to the contents of the initial count storage register, presets the status flip-flops to the contents of the initial status storage register and also resets the number of revolutions counter to zero.

The final storage registers and comparators work in a similar manner for loading a final angle when required, however there are no provisions for presetting the up-down counter and status flip-flops from these registers.

The initial and final compare signals are used in the oscillation modes to cause a direction reversal by applying the signals through mode switch C to clock the up-down flip-flop.

The initial compare is used in the fine rotation and finite oscillation modes as a count input to the number of revolutions counter. When the number of revolutions counter equals the count stored in the number of revolutions storage register, the compare circuitry generates a signal which goes through mode switch B to stop the V.C.O. clock. Assume five revolutions are desired in the finite rotation mode. The number of revolutions storage is reset to zero by pressing the section reset pushbutton. The number of revolutions load pushbutton is now pressed five times causing the number of revolutions storage counter to count up to five. Each time that rotation is initiated, the raster will make five complete revolutions before it ceases. The raster will al-

ways come to a stop at the initial angle.

Up to this point in the description we have covered the generation of a 7 bit number which represents an angle between 0° and 90° . We have also generated two bits of information to control the sign of the sine and cosine output.

We will now describe the circuitry of the memory card J2 and the D/A converter card J1.

The memory card contains a section length decode circuit which consists of a counter to count section change pulses and a dual 2 line to 4 line decoder which enables one at a time the section enable lines. At vertical reset time the counter is reset and section one enable goes true allowing data from section one's memory address card to appear at the input to the memory address storage register. When a section change pulse occurs, section two will be enabled and section one disabled, etc. for section three through five.

When the section change pulse occurs, a memory strobe pulse is generated which stores the 7 bit memory address or angle in the memory address storage register, and stores the sine and cosine sign data in the sign storage register. This memory strobe pulse then generates an update sine pulse which gates the data directly through the address complement gate to the input of the ROM. Within one microsecond the ROM's output will contain an 8 bit representation of the sine of the angle. The update sine pulse strobes this 8 bit data along with the sine sign bit into the D/A sine storage register and the D/A converter will settle within five microseconds to the analog voltage representing the sine of the angle.

(2)

The update sine pulse at its completion generates an update cosine pulse which complements (inverts) the memory address in the address complement gate. The ROM now generates an 8 bit number representing the cosine of the original angle. This data along with the cosine sign is stored by the update cosine pulse in the D/A cosine storage register and the cosine D/A settles to the analog voltage representing the cosine of the original angle.

The entire update occurs within the blanking interval between sections. The sine and cosine storage registers located on the D/A card will now retain this data until a new section change pulse occurs.

The D/A converter card contains circuitry within the storage register blocks to also complement the data which was discussed in the Theory of Operation. The actual D/A converter is a 10 bit digital to current converter with the least significant bit disabled. The current output is converted to a voltage with one operational amplifier and this voltage is buffered by a short-circuit proof driver circuit.

COMPUTER IMAGE MATERIAL LIST
MEMORY ADDRESS CARD - SCCS-100C (cont.)
ROTATION CONTROLLER
SCANIMATE

Drawing No.	Description	No. Req'd.
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- RESISTORS -		
Resistors are fixed, composition $\pm 5\%$ unless otherwise specified		
R1,2	10k ohm 1/4w	2
R12,13,14,20,21	5.6k ohm 1/4w	5
R15,16,17,19	5.1k ohm 1/4w	4
- HARDWARE -		
	Card Ejector	1
	Scanbe S-200	

MEMORY ADDRESS CARD - SCCS-100C
ROTATION CONTROLLER
SCANIMATE

Drawing No.	Description	No. Req'd.
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SCCS-100C	SCCS-100C Memory Address Card Computer Image SCCS-100C	1
- CAPACITORS -		
C1	100 ufd 25v M/E ET101X025A5	1
C2,3,4,5,6	.01 ufd 100v Sprague TG-S10	5
C7,8	470 pf 500v GI RDM15 FD471J03	2
- INDUCTORS -		
L1	27 uh 10% Cambion 550-2950-30-2	1
- INTEGRATED CIRCUITS -		
IC1,6	SN7400N TI	2
IC2	SN7410N TI	1
IC3,4,5	SN7401N TI	3
IC7,8,9,15,16	SN7475N TI	5
IC10,11	SN74195N TI	2
IC12,13,14,17, 18,19	SN74185N	6
IC20,21	SN7404N TI	2
IC22,23	SN7430N TI	2

(cont.)

COMPUTER IMAGE MATERIAL LIST
CONTROL CARD - SCCS-101D
ROTATION CONTROLLER
SCANIMATE

Drawing No. Description No. Req'd.

SCCS-101D	SCCS-101D Control Card Computer Image SCCS-101D	1
C1	100 ufd 25v N/E ET101X025A5	Elect 1
C2,3,4,5,8,9	.01 ufd 100v Sprague TG-S10	Cer 6
C6	.001 ufd 1kv Sprague 56A-D10	Cer 1
C7	820 pf 500v GI RDM15 FC821J03	Mica 1
C10,11	500 pf 500v GI RDM15 FD561J03	Mica 2
C12,13	620 pf 500v GI RDM15 FD301J03	Mica 2
L1	27 uh Cambion 550-2950-30-2	1
IC1,3	SN7493N TI	2
IC2	SN74L85N TI	1
IC4,5,7,8,11,17	SN7400N TI	6

(cont.)

COMPUTER IMAGE MATERIAL LIST
CONTROL CARD - SCCS-101D (cont.)
ROTATION CONTROLLER
SCANIMATE

Drawing No. Description No. Req'd.

- INTEGRATED CIRCUITS - (cont.)

IC6,16	SN7410N TI	2
IC9,12	SN7476N TI	2
IC10	SN7451N TI	1
IC13	SN7420N TI	1
IC14,15	9601 PC Fairchild	2

- RESISTORS -

Resistors are fixed, composition + 5% unless otherwise indicated

R2,3,5,6,8,9	5.6k ohm 1/4w	6
R4,7,10,11,12,13	10k ohm 1/4w	6

- HARDWARE -

Card Ejector Scanbe S-200	1
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COMPUTER IMAGE MATERIAL LIST
MEMORY CARD - SCCS-102C (cont.)
ROTATION CONTROLLER
SCANINATE

Drawing No.	Description	No. Req'd.
IC8, 9, 10, 11	- INTEGRATED CIRCUITS - (cont.) SN7401N TI	4
IC12, 13	DM8810N NSC	2
IC14	IN7602 AA Intersil	1
IC15	SN7493N TI	1
IC16	SN74155N TI	1
IC17	SN7404N TI	1

- RESISTORS -

Resistors are fixed, composition $\pm 5\%$ unless otherwise indicated

R1, 2, 4, 5	10k ohm	1/4w	4
R3	51k ohm	1/4w	1
R7	56 ohm	1/2w	1
R8	150 ohm	1/2w	1
R9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22	3k ohm	1/4w	14
R23, 24, 25, 26, 27, 28, 29, 30	6.8k ohm	1/4w	8
R31, 32	5.6k ohm	1/4w	2
R33, 34, 35, 36, 37, 38, 39	1k ohm	1/4w	7

(cont.)

COMPUTER IMAGE MATERIAL LIST
MEMORY CARD - SCCS-102C
ROTATION CONTROLLER
SCANINATE

Drawing No.	Description	No. Req'd.
SCCS-102C	- CIRCUIT BOARD - SCCS-102C Memory Card Computer Image SCCS-102C	1
C1, 2, 10	.01 ufd 100v Sprague TG-S10	2
C3	200 pf 500v GI RDM15 FD201J03	1
C4, 5	500 pf 500v GI RDM15 FD501J03	2
C5, 7, 8	100 ufd 25v M/E ET101X025A5	3
C9	.001 ufd 1kv Sprague 5GA-D10	1
D1, 2	- DIODES - 1N963 12v 400mw	2
L1	- INDUCTORS - 27 uh Cambion 550-2950-30-2	1
IC1	- INTEGRATED CIRCUITS - SN7400N TI	1
IC2, 3, 4	9601 PC Fairchild	3
IC5	SN7440N TI	1
IC6, 7	SN7475N TI	2

(cont.)

COMPUTER IMAGE MATERIAL LIST
D/A CONV. SINE-COS. GEN. CARD - SCCS-103B
ROTATION CONTROLLER
SCAVINATE

COMPUTER IMAGE MATERIAL LIST
D/A CONV. SINE-COS. GEN. CARD - SCCS-103B
ROTATION CONTROLLER
SCAVINATE

Drawing No.	Description	No. Req'd.	Drawing No.	Description	No. Req'd.
Resistors are fixed, composition 5% unless otherwise indicated					
R2,3	5.1 ohm 1/2w	2	SCCS-103B	- CIRCUIT BOARD - SCCS-103B D/A Conv. Sine-Cos. Gen. Card Computer Image SCCS-103B	1
R4,15	100 ohm 1/2w Bourns 3329P-1-101	2			
R5,14	10k ohm 3/4w Beckman 89PR10X	2	C1,2,3	- CAPACITORS - 100 ufd 25v M/E E1101X025A5	3
R6,15	10k ohm 1/4w	2	C4,5,6,7,9,10,12,15	.01 ufd 100v Sprague TG-S10	8
R7,16	7.5k ohm 1/4w	2	CS,11	180 pf 500v GI RDM15 FDI81J03	2
R8,17	5k ohm 3/4w Beckman 89PR5K	2			
R9,10,18,19	15k ohm 1/4w	4			
R11,12,20,21	39 ohm 1/4w	4	DI,2,3,4,5,6,7,8,9,10,11,12	- DIODES - IN5064 Fairchild	12
R22,23	1k ohm 1/4w	2			
	- HARDWARE -				
	Card Ejector Scanbe S-200	1	L1	- INDUCTORS - 27 uh Cambion 550-2950-30-2 10%	1
	16 Pin IC Socket Amp 5835 29-1	2			
	- TRANSISTORS -		IC1,14	- INTEGRATED CIRCUITS - aim DAC-100AD/Q1 Precision Nonolithics	2
Q1,3	2N3569 Fairchild	2	IC2,15	HA2-2515-5 Harris	2
Q2,4	2N3644 Fairchild	2	IC3,4,12,15	SN74H87N TI	4
			IC5,6,7,10,11,16	SN7475N TI	6
			IC3,9	SN7404N TI	2

(cont.)

COMPUTER IMAGE MATERIAL LIST
RATE CLOCK CARD - SCCS-105B-2
ROTATION CONTROLLER
SCANIMATE

Drawing No.	Description	No. Req'd.
SCCS-105B-1	SCCS-105B-1 Rate Clock Card Computer Image SCCS-105B-1	1
	- CIRCUIT BOARD -	
C1,2,3	100 ufd 25v M/E ET101X025A5	3
C19,22	.002 ufd 1kv Sprague 5GA-D20	2
C20,21	.01 ufd 100v Sprague TG-S10	2
C23	.033 ufd 100v Sprague 225P53391WD3	1
	- CAPACITORS -	
L1	27 uh Cambion 550-2950-30-2 10%	1
	- INDUCTORS -	
	- INTEGRATED CIRCUITS -	
IC1	SN7400N TI	1
IC14	MC1439G Mot	1
IC15	9601 PC Fairchild	1
IC16	MC831P Mot	1
IC17	SN7490N TI	1

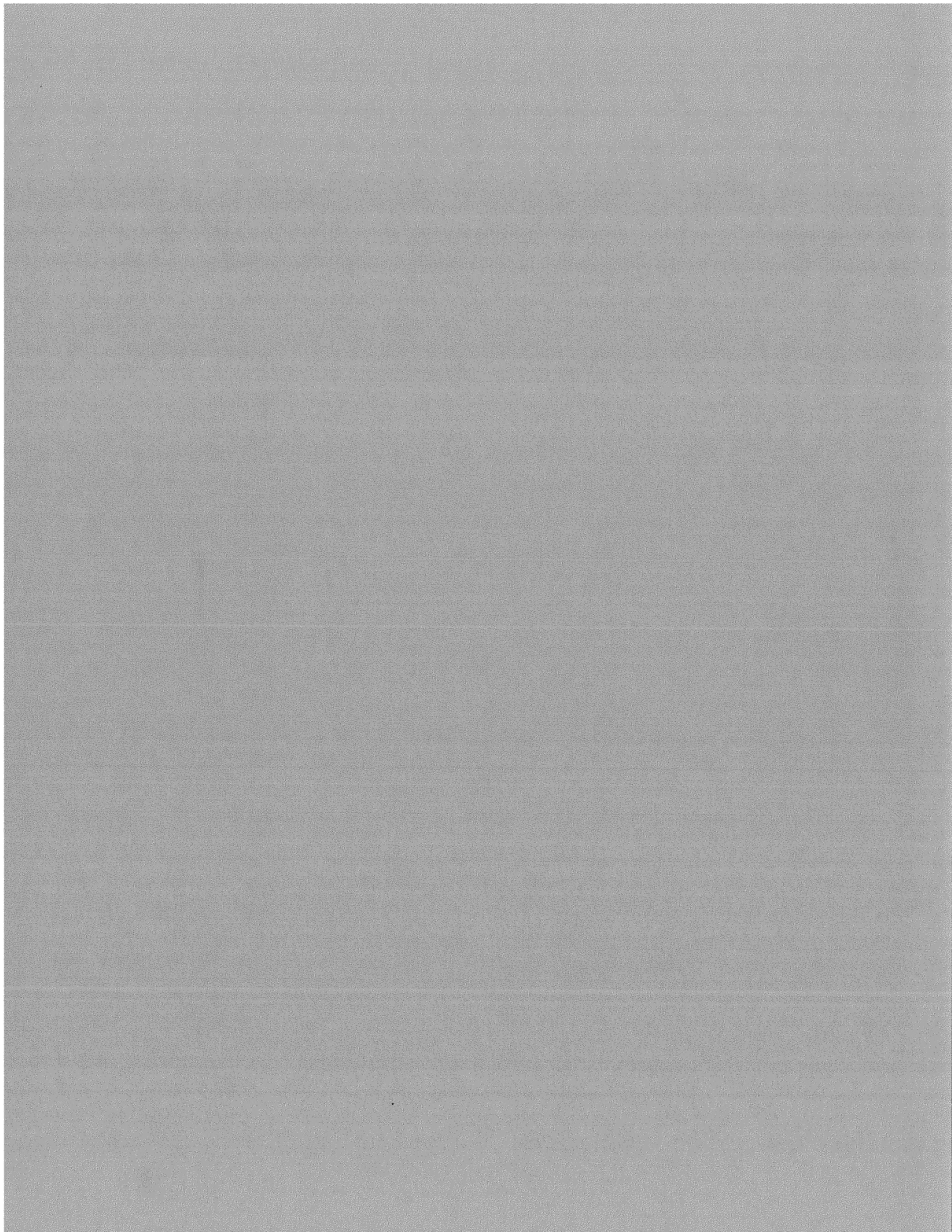
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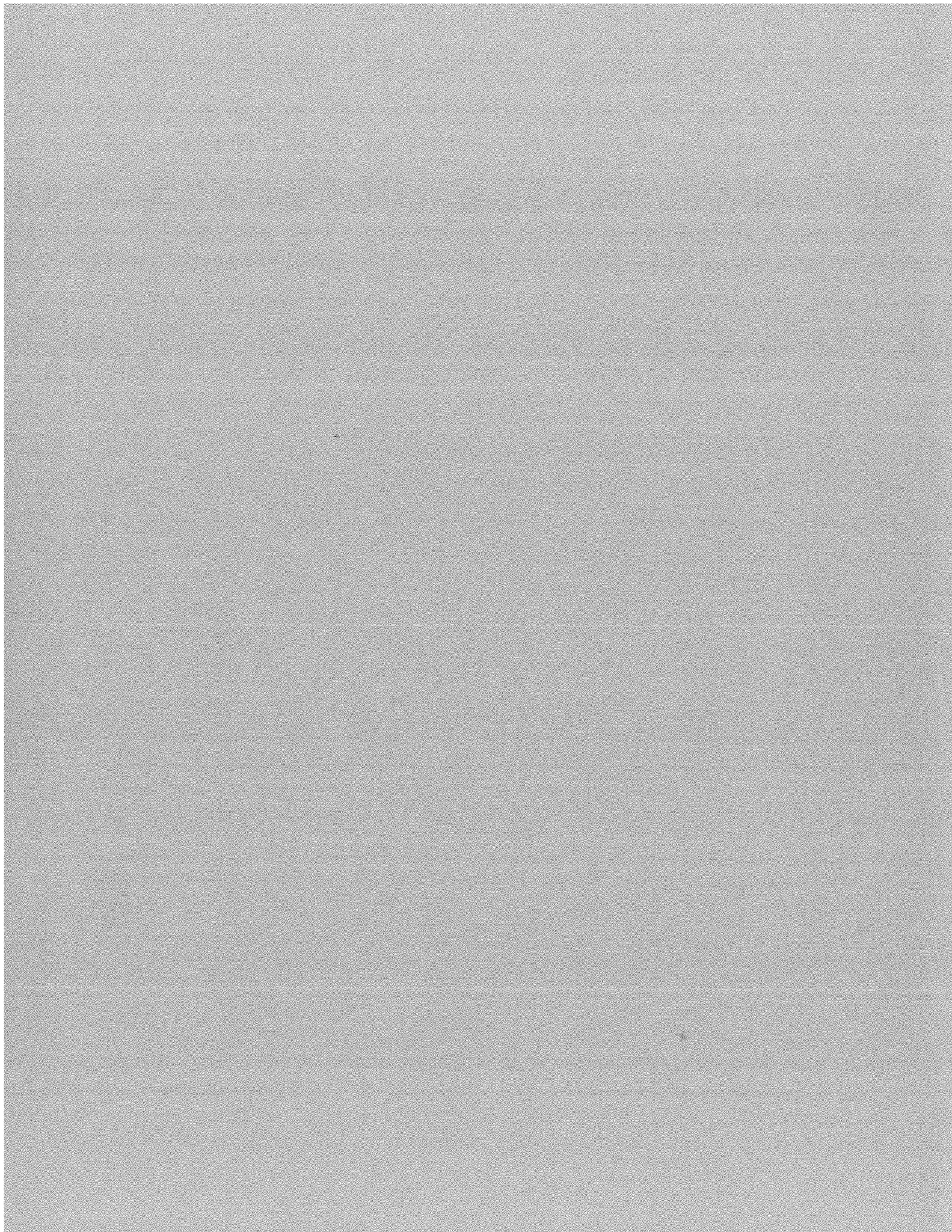
COMPUTER IMAGE MATERIAL LIST
SEQUENCE CONTROL CARD - SCCS-104A
ROTATION CONTROLLER
SCANIMATE

Drawing No.	Description	No. Req'd.
SCCS-104A	SCCS-104A Sequence Control Card Computer Image SCCS-104A	1
	- CIRCUIT BOARD -	
C1	100 ufd 25v M/E ET101X025A5	1
C4,5	470 pf 500v GI RDM15 FD471J03	2
	- CAPACITORS -	
IC1,2	SN7440N TI	2
IC3	SN7410N TI	1
IC4	9602 PC Fairchild	1
	- INTEGRATED CIRCUITS -	
	- RESISTORS -	
	Resistors are fixed, composition 5% unless otherwise indicated	
R1	2.7 ohm 1/2w	1
R5,6	10k ohm 1/4w	2
R10,11	5.1k ohm 1/4w	2
	- HARDWARE -	
	Card Ejector Scanbe S-200	1

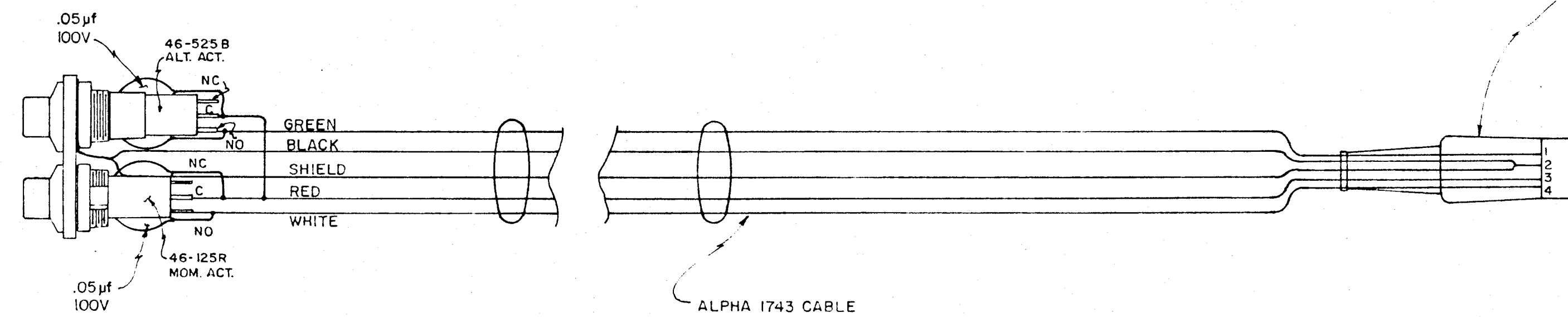
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 RATE CLOCK CARD - SCCS-105B-2 (cont.)
 ROTATION CONTROLLER
 SCANIMATE

Drawing No.	Description	No. Req'd.
Resistors are fixed, composition $\pm$ 5% unless otherwise indicated		
R2,3	5.1 ohm 1/2w	2
R28,29,30,32,33	10k ohm 1/4w	5
R31	51k ohm 1/4w	1
R34	390 ohm 1/4w	1
R35	43k ohm 1/4w	1
* HARDWARE -		
	Card Ejector	1
	Scanbe S-200	

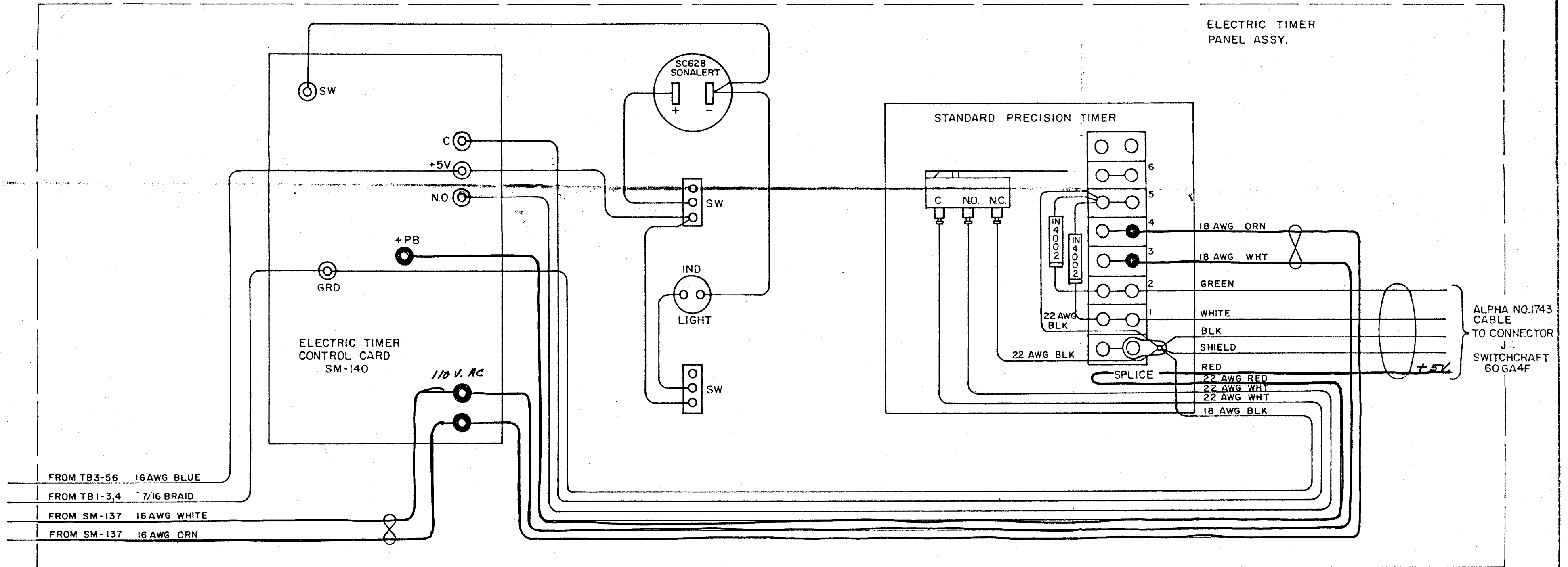




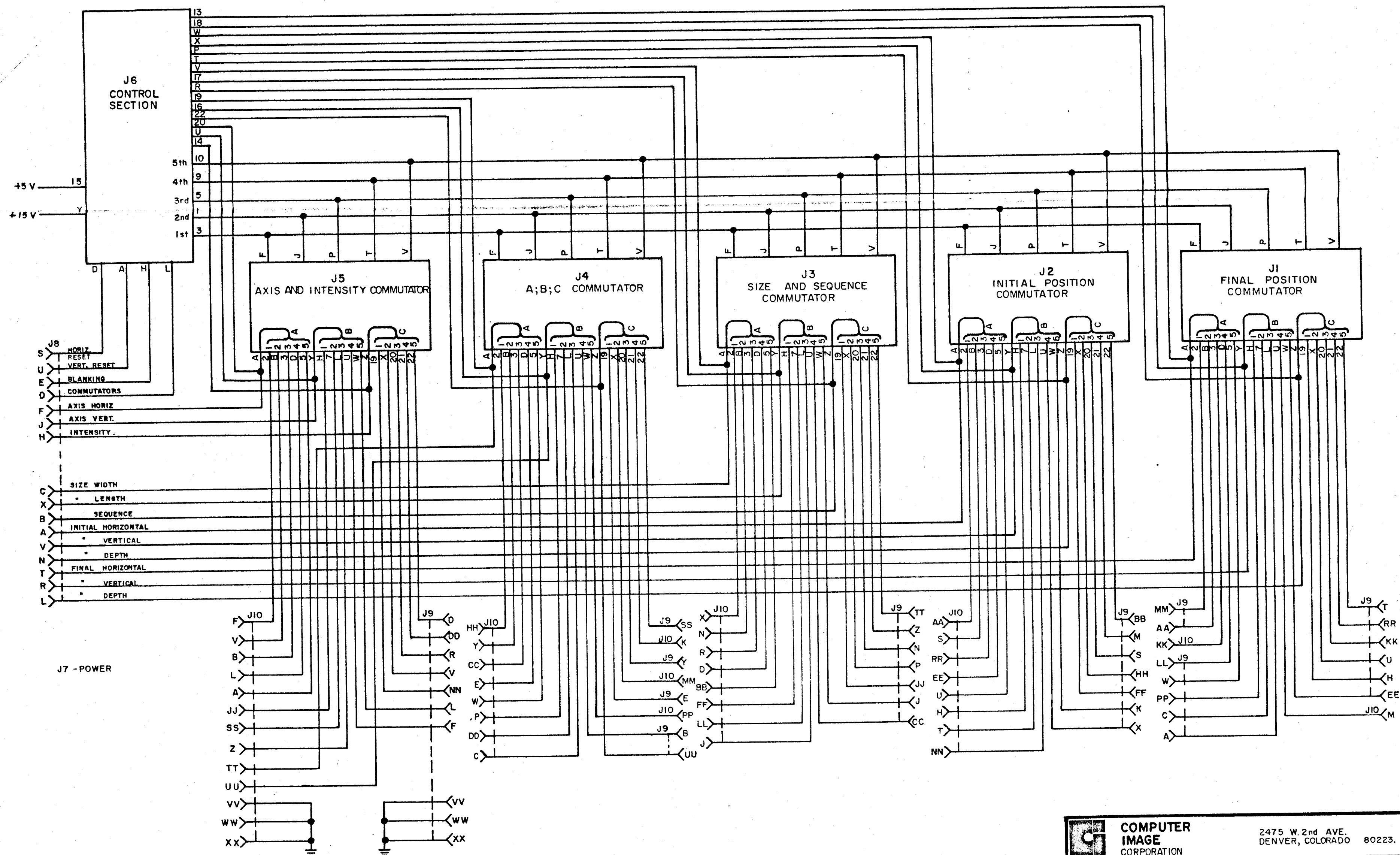
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IN RACK # 2



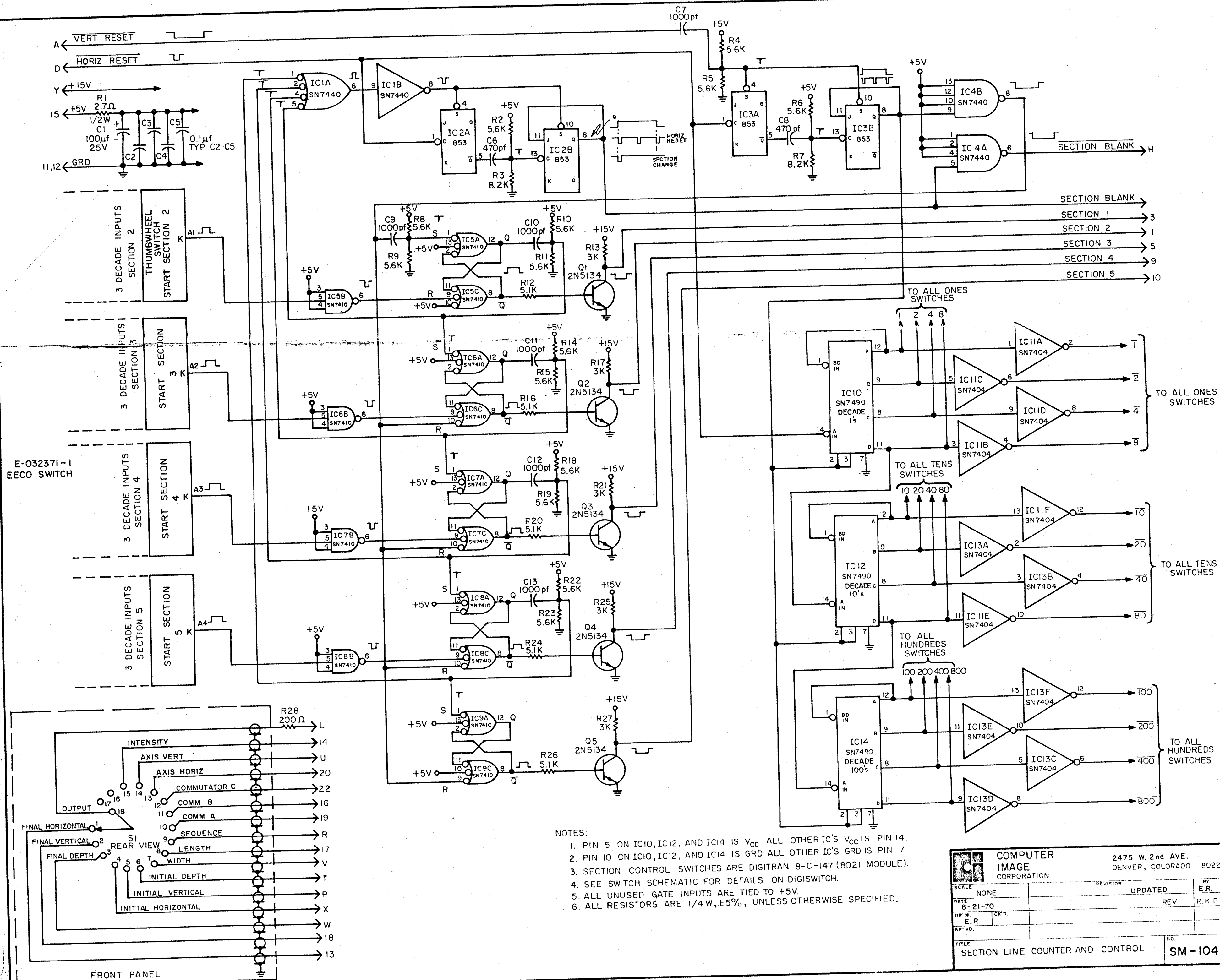
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TITLE			
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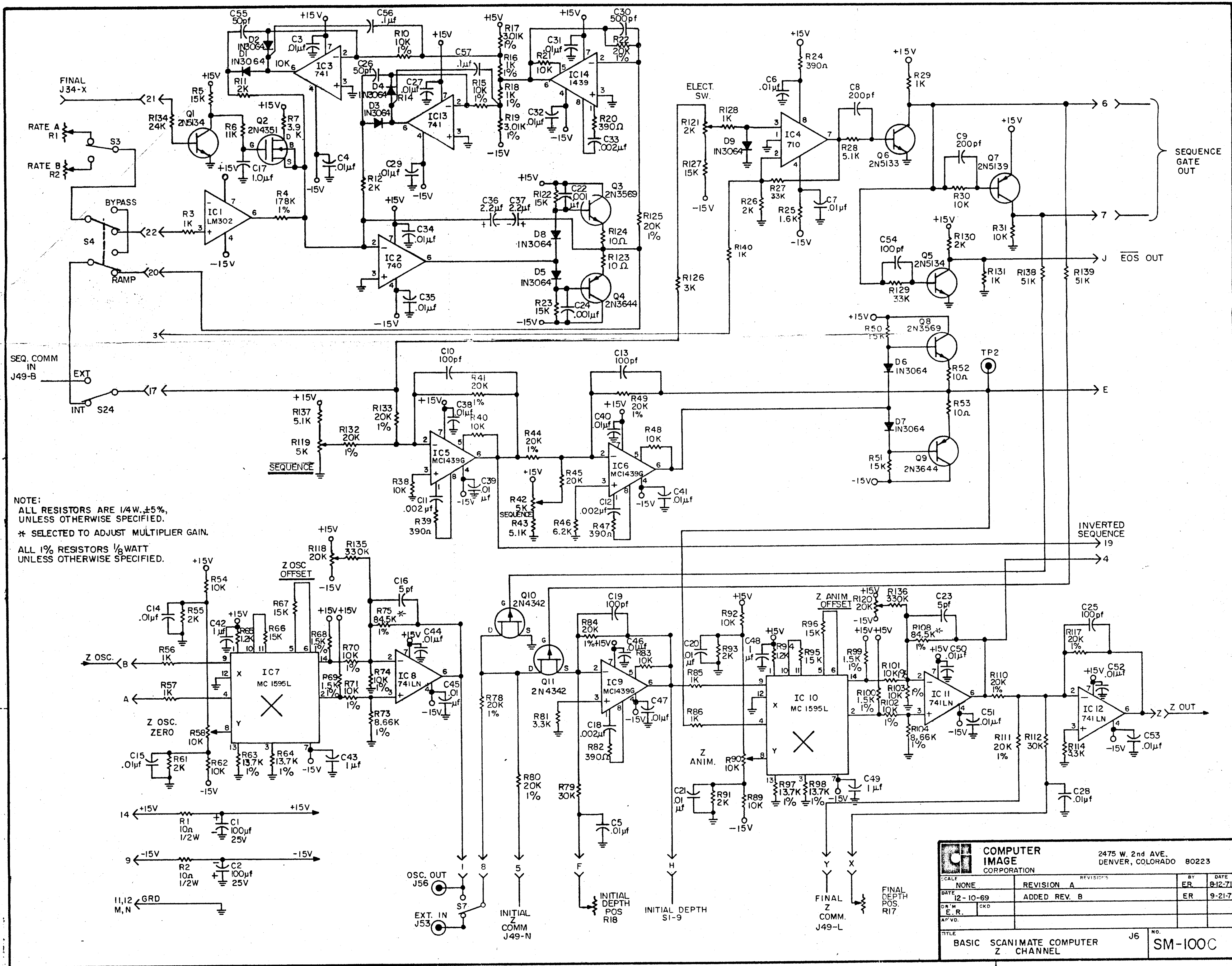
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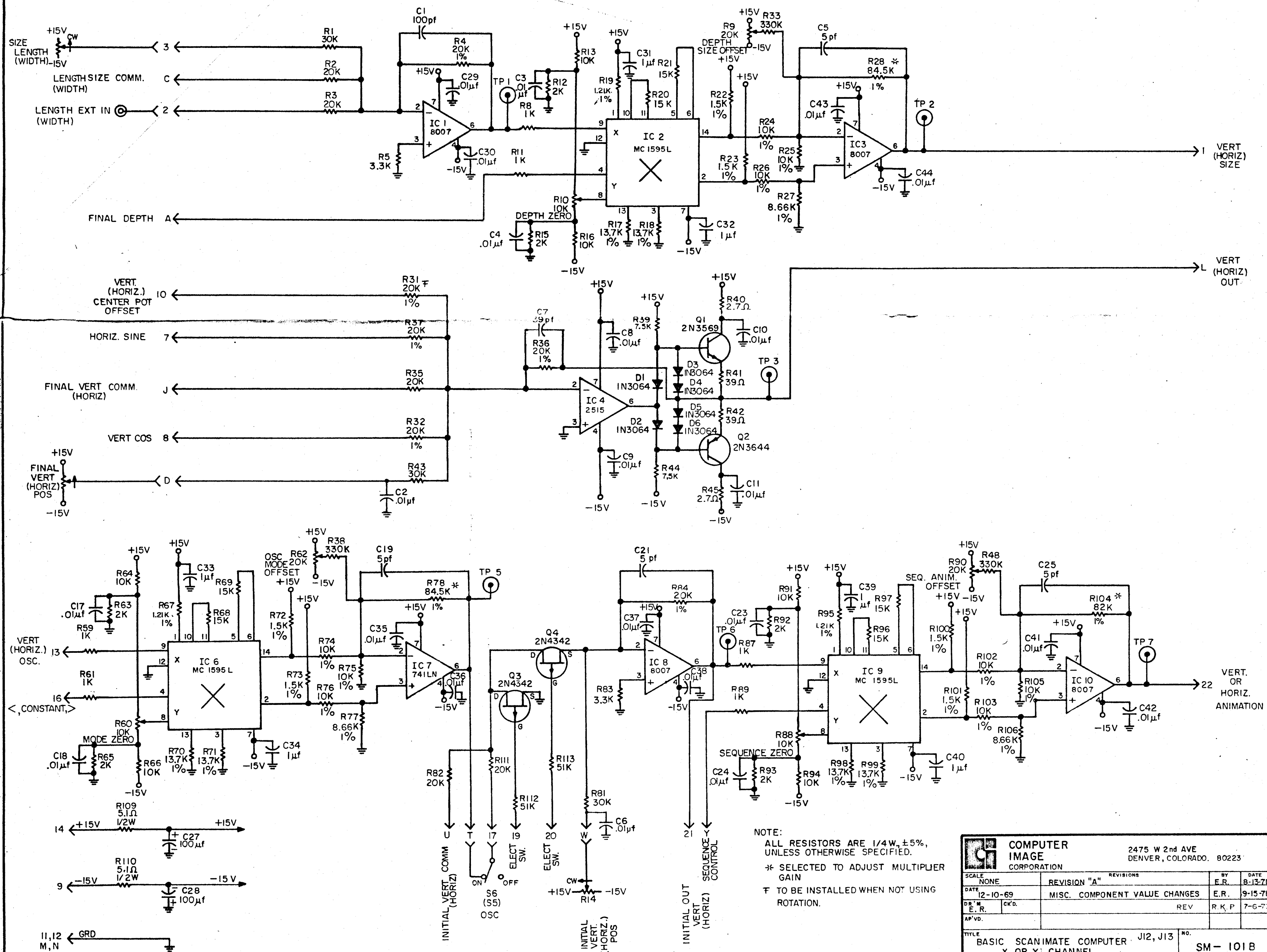
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DR. W.	E. R.	CK'D.	
AP'VD.			
TITLE SCANIMATE COMMUTATOR WIRING DIAGRAM			NO. SMW - 101A



COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REVISION	UPDATED
DATE	8-21-70	REV	R.K.P.
DR'W.	E.R.	CK'D.	
AP'VD.			
TITLE		NO.	
SECTION LINE COUNTER AND CONTROL		SM-104 C	



COMPUTER IMAGE CORPORATION 2475 W. 2nd AVE. DENVER, COLORADO 80223		REVISION A ADDED REV. B		BY ER	DATE 8-12-71
SCALE NONE		REVISION B ADDED REV. B		BY ER	DATE 9-21-71
DATE 12-10-69		REVISION C ADDED REV. B		BY ER	DATE 9-21-71
DRAWN E. R.		CHECKED CKD		BY ER	DATE 9-21-71
TITLE BASIC SCANIMATE COMPUTER Z CHANNEL		J6		NO. SM-100C	1



COMPUTER IMAGE CORPORATION		2475 W 2nd AVE DENVER, COLORADO. 80223	
SCALE	NONE	REVISIONS	BY
DATE	12-10-69	MISC. COMPONENT VALUE CHANGES	E.R.
DR'M	E.R.	REV	R.K.P
AP'VD.			
TITLE BASIC SCANIMATE COMPUTER X OR Y CHANNEL		J12, J13 NO.	SM-101B

SECT. 1
A IN
SECT. 1
GATE
SECT. 2
A IN
SECT. 3
A IN
SECT. 4
A IN
SECT. 5
A IN
SECT. 2
GATE

SECT. 1
B IN
SECT. 2
B IN
SECT. 3
GATE
SECT. 3
B IN
SECT. 4
B IN
SECT. 5
B IN
SECT. 4
GATE

SECT. 1
C IN
SECT. 2
C IN
SECT. 3
C IN
SECT. 4
C IN
SECT. 5
C IN
SECT. 5
GATE

*From Section 1
Combined*

*Time of
of lines
Line 1
Line 2
Line 3
Line 4
Line 5
Line 6
Line 7
Line 8
Line 9
Line 10
Line 11
Line 12
Line 13
Line 14
Line 15
Line 16
Line 17
Line 18
Line 19
Line 20
Line 21
Line 22
Line 23
Line 24
Line 25
Line 26
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Line 83
Line 84
Line 85
Line 86
Line 87
Line 88
Line 89
Line 90
Line 91
Line 92
Line 93
Line 94
Line 95
Line 96
Line 97
Line 98
Line 99
Line 100*

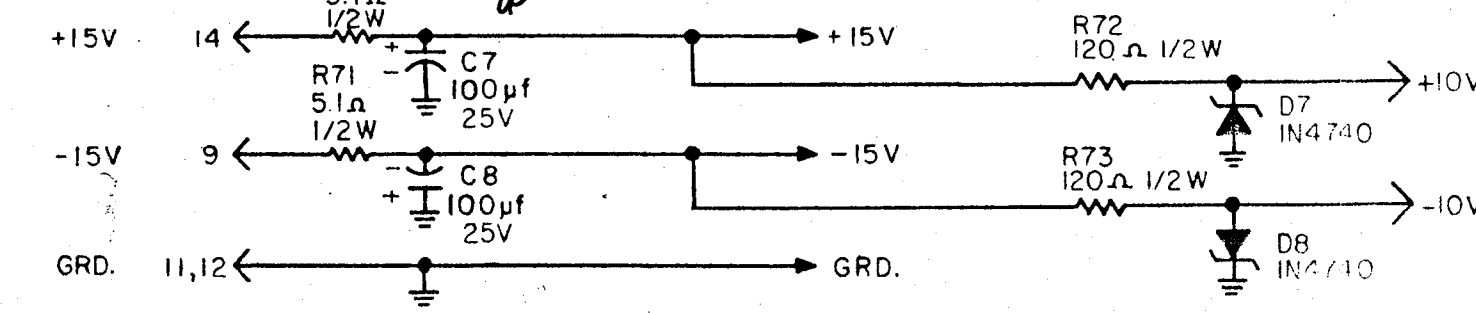
+ on gate causes increase in reverse bias & fet is off

This period is time for # of lines. When this goes low & this goes high.

Low & this goes high.

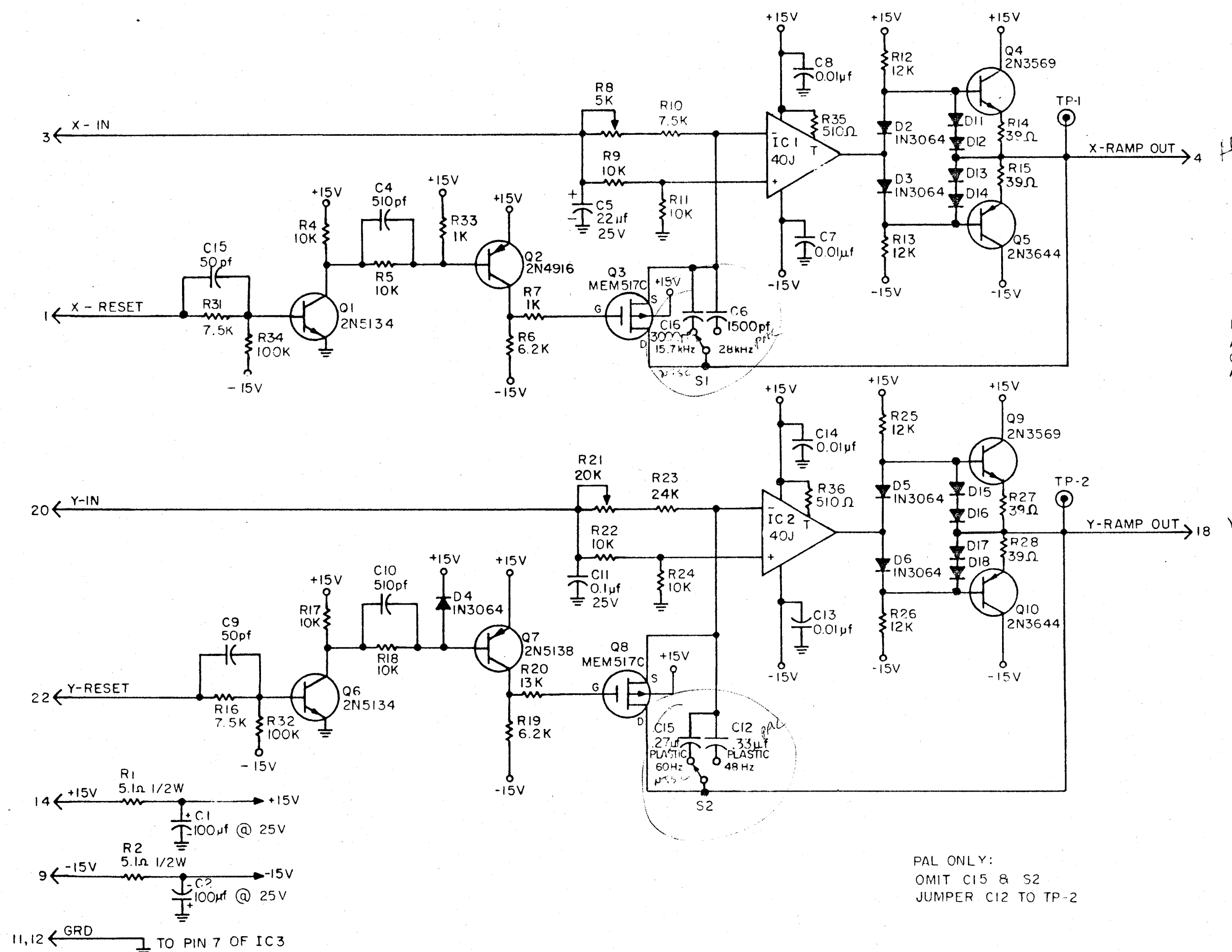
+ on gate causes increase in forward bias & fet is on. 0 on gate causes increase in reverse bias & fet is off for this period of time.

as section 5

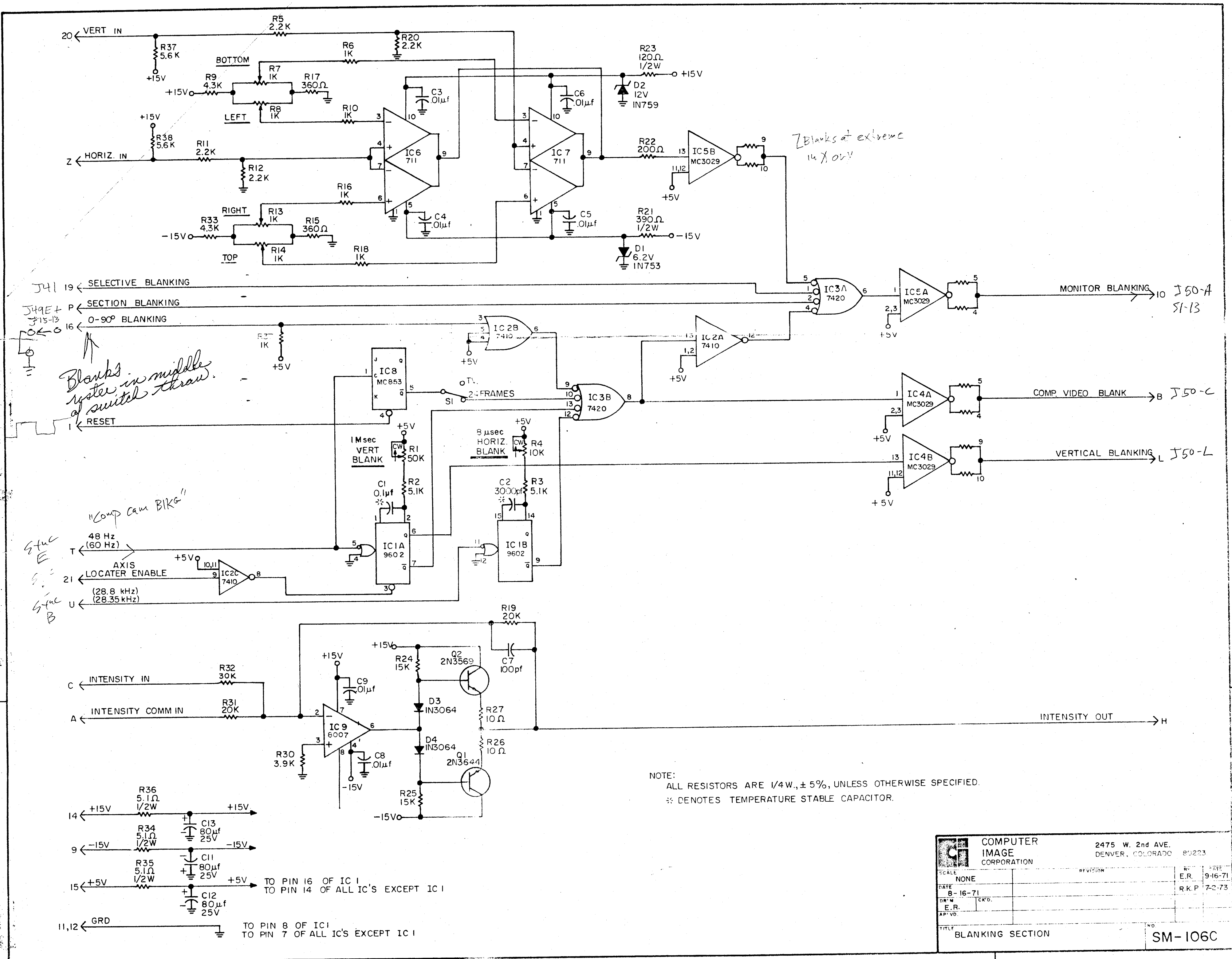


ALL RESISTORS 1/4 WATT 5% UNLESS OTHERWISE SPECIFIED

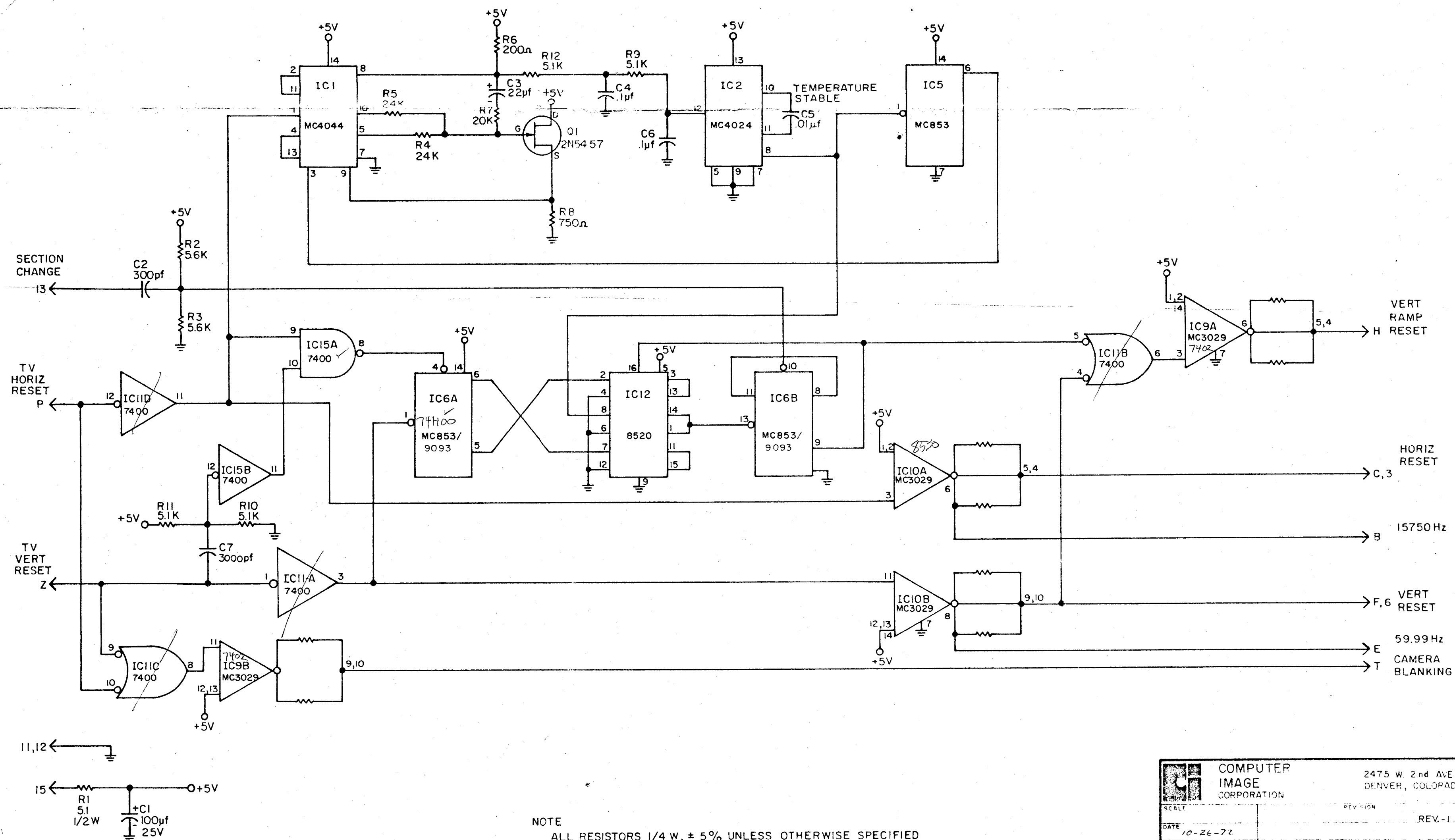
COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO. 80223	
SCALE	NONE	REVISIONS	REV. A
DATE	12-10-69	BY	E.R.
DR. M.	CK. D.		
AP. VD.			
TITLE		NO.	
SCANIMATE COMPUTER - COMMUTATOR		SM - 102A	



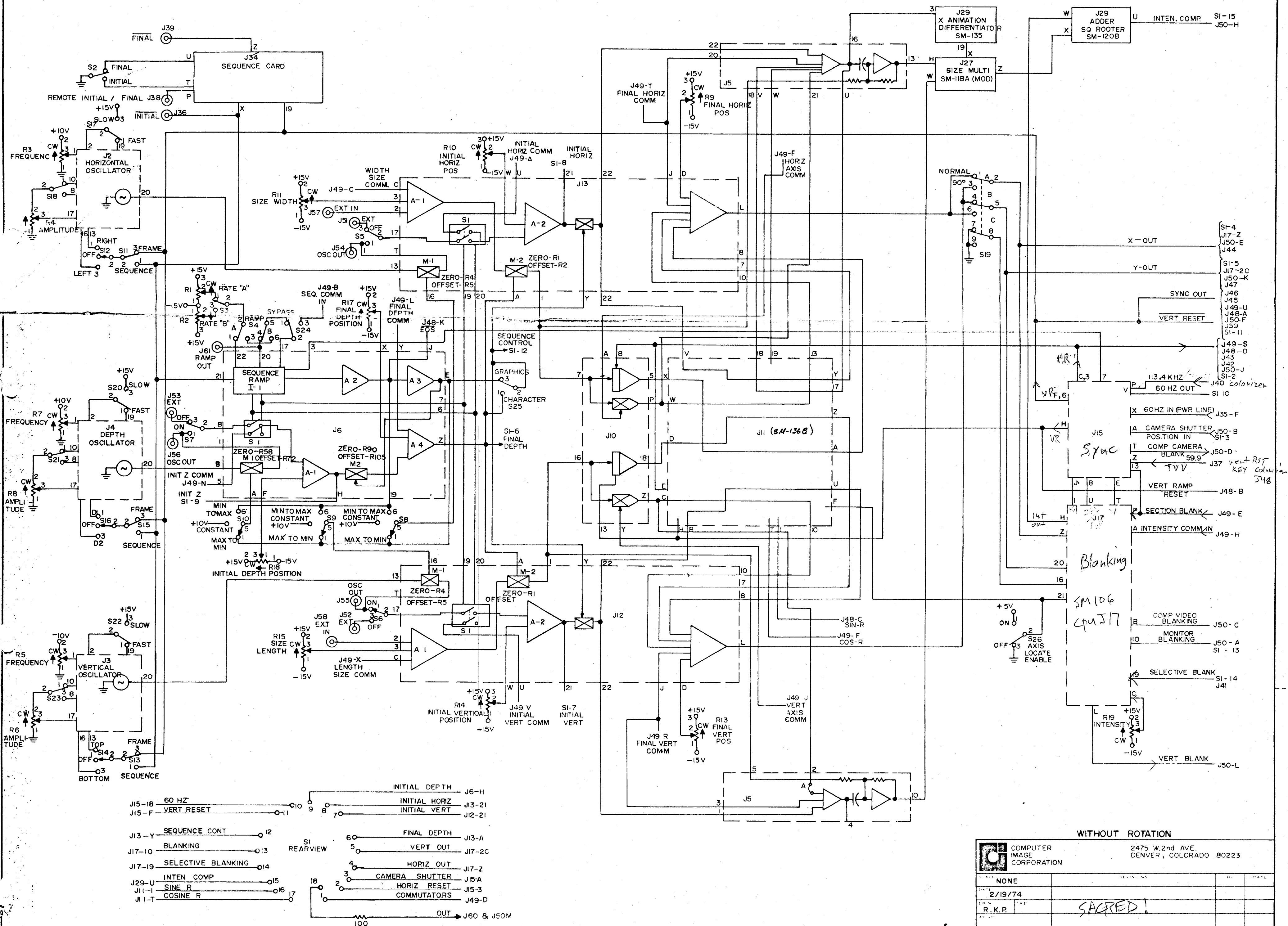
COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE DENVER, COLORADO 80223	
SCALE NONE	REVISION C	REV D-1	DATE 2-16-73
DATE 2-2-70	REV D-1	R.K.P.	12/31/73
APVD	REV	B. A.	4/5/74
TITLE DUAL RAMP GENERATOR		NO SM-113D	



COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223	
SCALE	NONE	REVISION	
DATE	8-16-71	E.R.	9-16-71
DRW	E.R.	R.K.P.	7-2-73
AP'D			
TITLE		NO.	
BLANKING SECTION		SM-106C	



COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80273	
SCALE	REV. 1	REV. 1	DATE
DATE	10-26-72	REV. 1	7-2-73
DRW	CHKD		
APVD			
TITLE		NO	
SYNC CARD FOR TV RATES		SM-144A	



WITHOUT ROTATION



COMPUTER
IMAGE
CORPORATION

2475 W.2nd AVE.
DENVER, COLORADO 80223

NONE

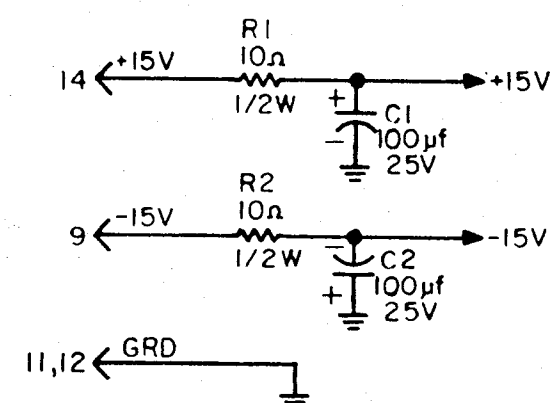
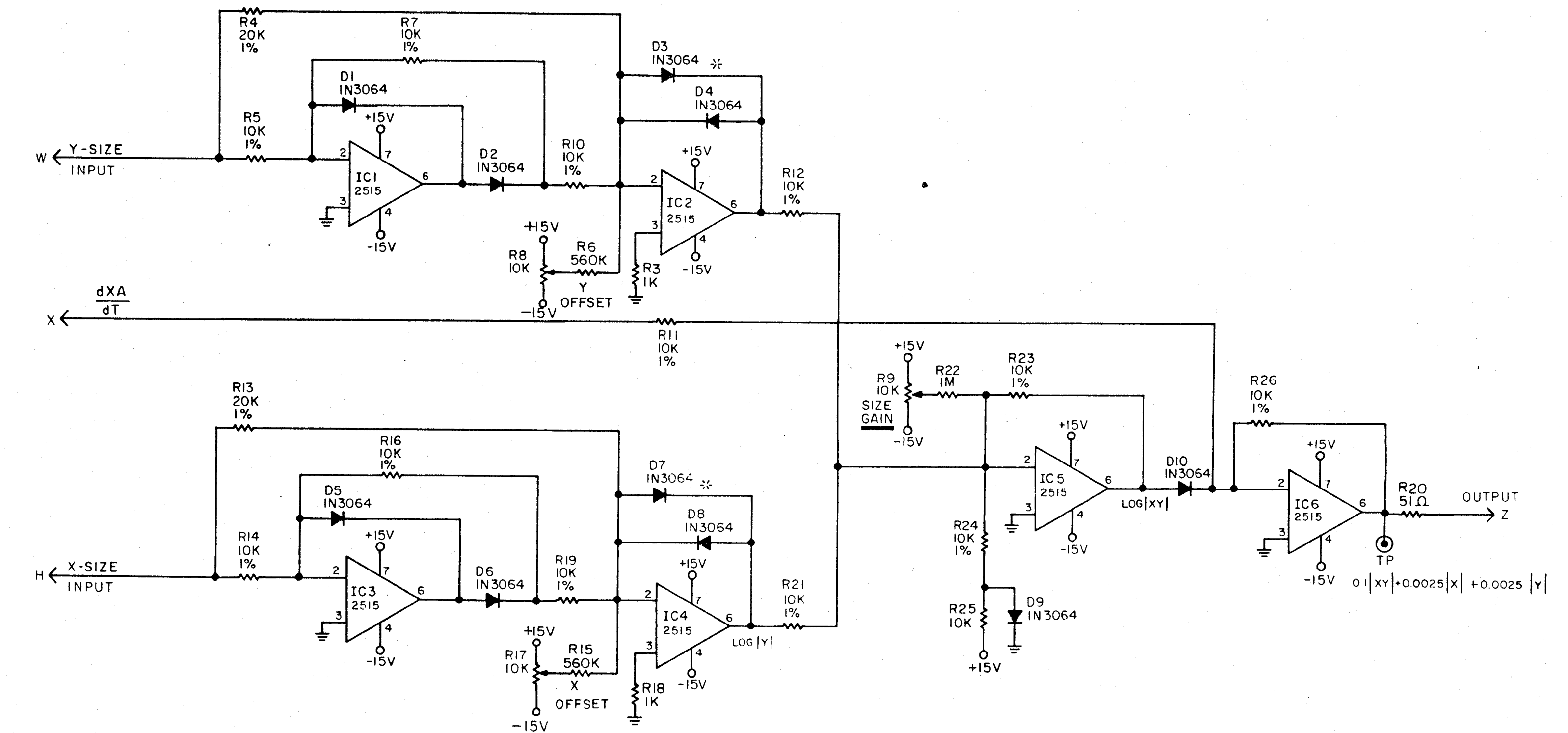
2/19/74

104

AF 51

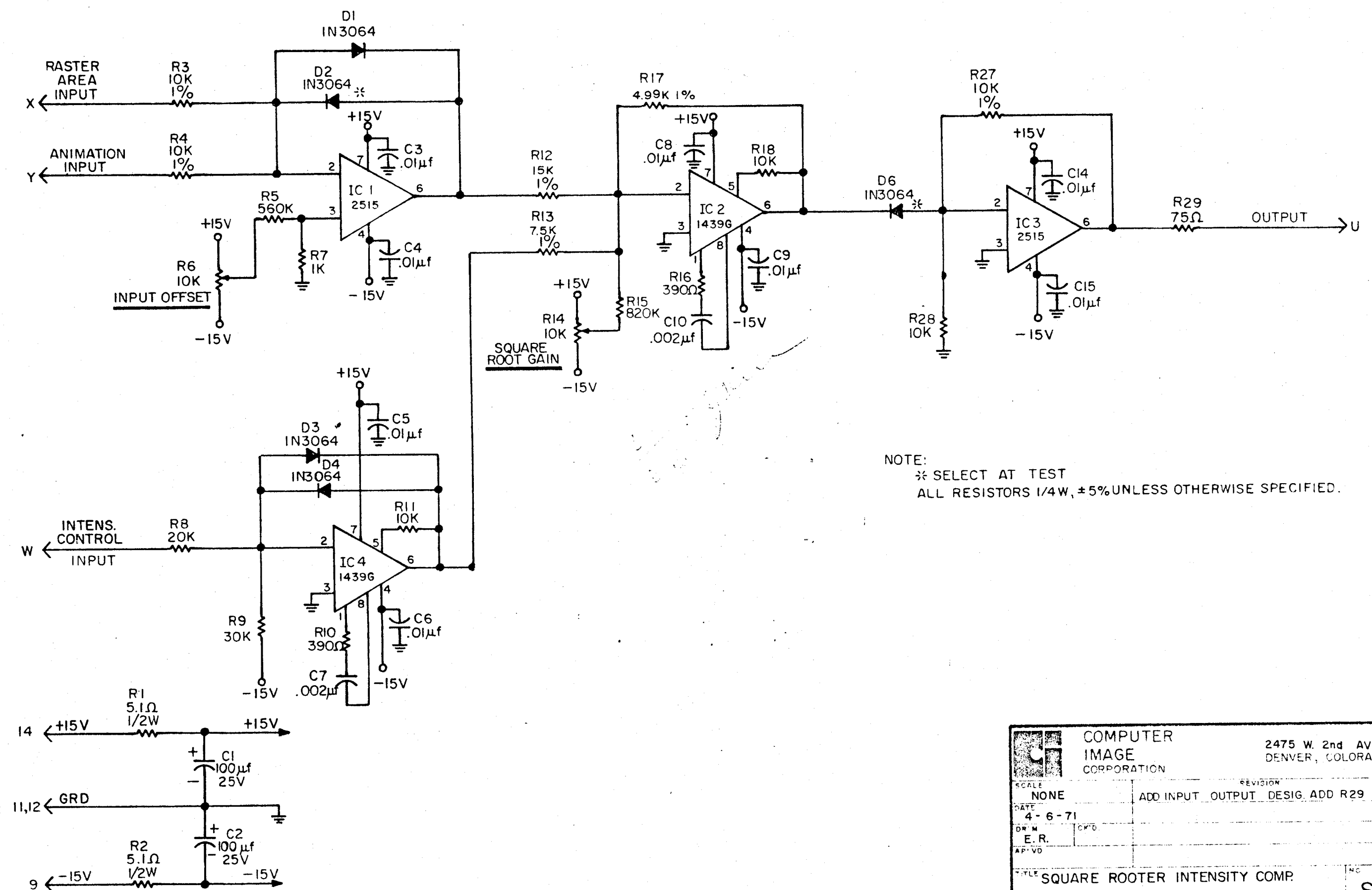
SCANIMATE COMPUTER

FUNCTIONAL DIAGRAM

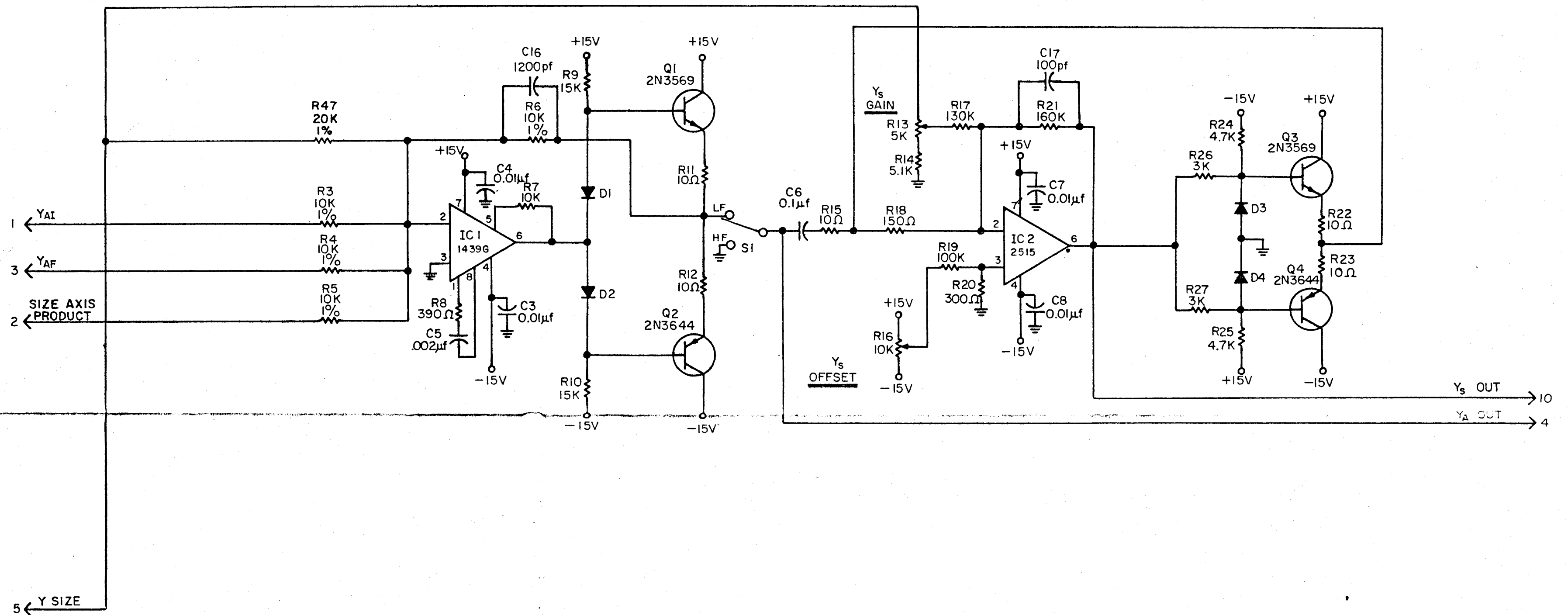


NOTE
 * SELECT AT TEST
 ALL RESISTORS 1/4 W, ±5% UNLESS OTHERWISE SPECIFIED.

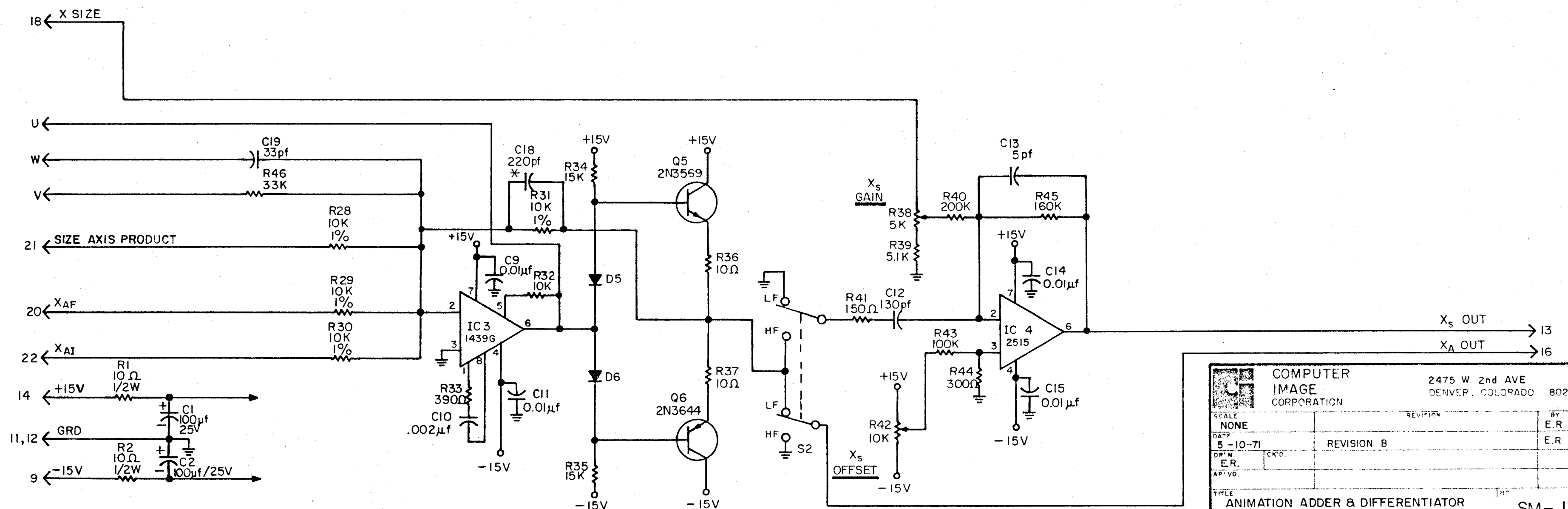
COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223	
SCALE	AS BUILT	REVISION	BY DATE
DATE 2-2-70			ER.BA 9-1971
DR'W. E.R.	CK'D.		
AP'VD.			
TITLE SIZE MULTIPLIER		NO. SM - 118A	



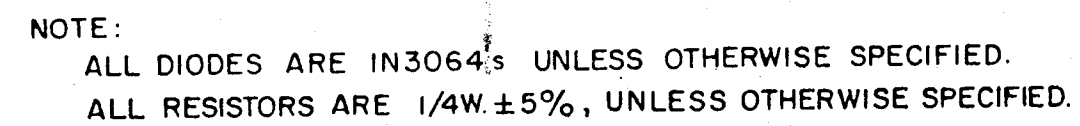
 COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223	
SCALE	NONE	REVISION	ADD INPUT OUTPUT DESIG. ADD R29
DATE	4-6-71	BY	ER.B.A. 9-19-71
DR. W.	E.R.	DATE	R.K.P. 7-3-73
TITLE		SM-120B	



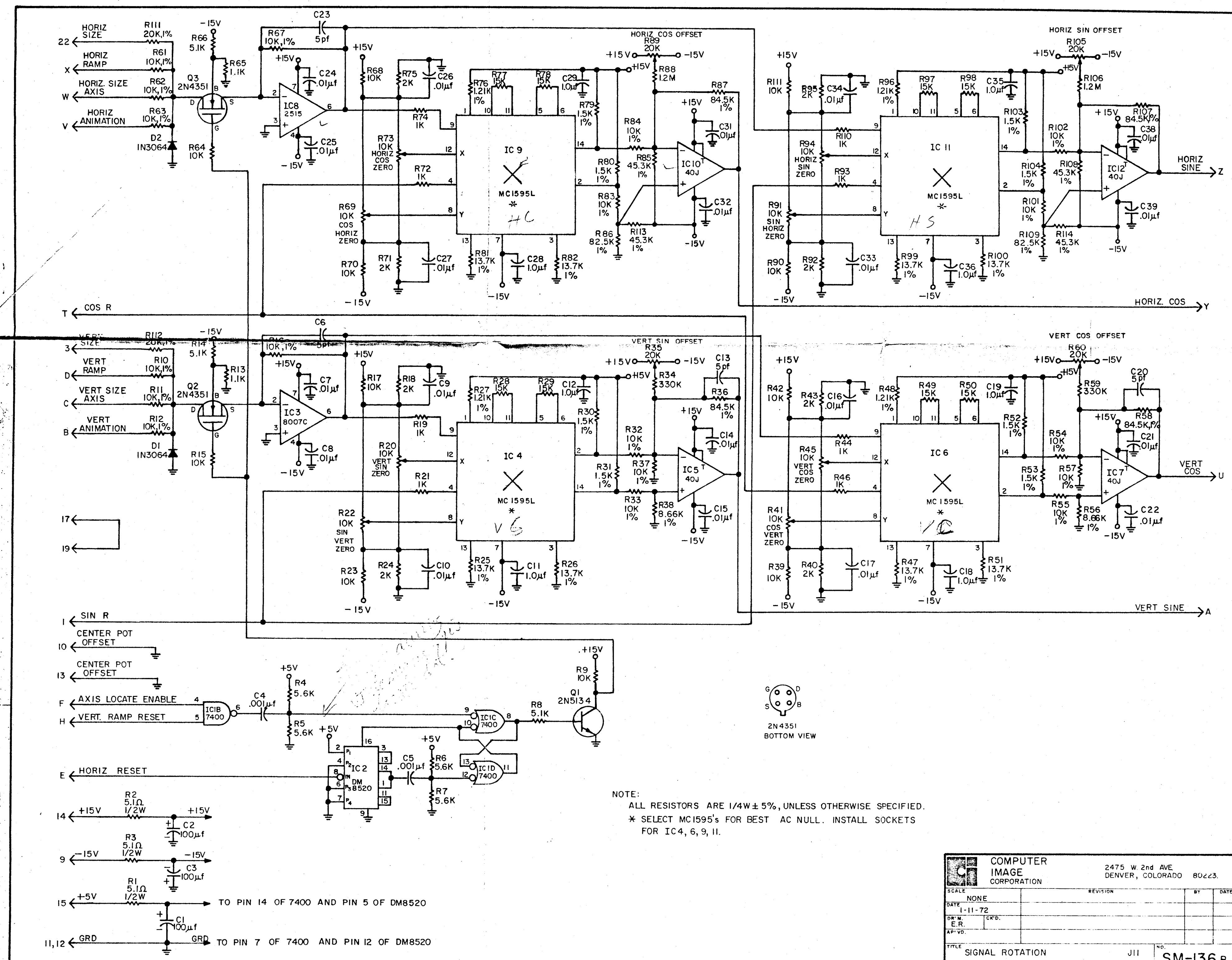
NOTE:
ALL DIODES IN3064.
ALL RESISTORS ARE 1/4W.±5%, UNLESS OTHERWISE SPECIFIED.
* WITH ROTATION



COMPUTER IMAGE CORPORATION		2475 W 2nd AVE DENVER, COLORADO 80223	
SCALE NONE	REVISION	BY E.R.	DATE 9-17-71
DATE 5-10-71	REVISION B	E.R.	1-11-72
DRN E.R.	CKD		
APP'D:			
TITLE ANIMATION ADDER & DIFFERENTIATOR			SM-134B

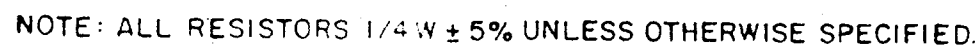


	COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223.	
	SCALE NONE	ADDED INPUT	REVISION OUTPUT	DESIG.
DATE 4-5-71			DATE 9-16-71	
DR'M E.R.	CK'D.			
AP'VD.				
TITLE INTENSITY COMP X ANIMATION DIFFERENTIATOR				NO. SM-135

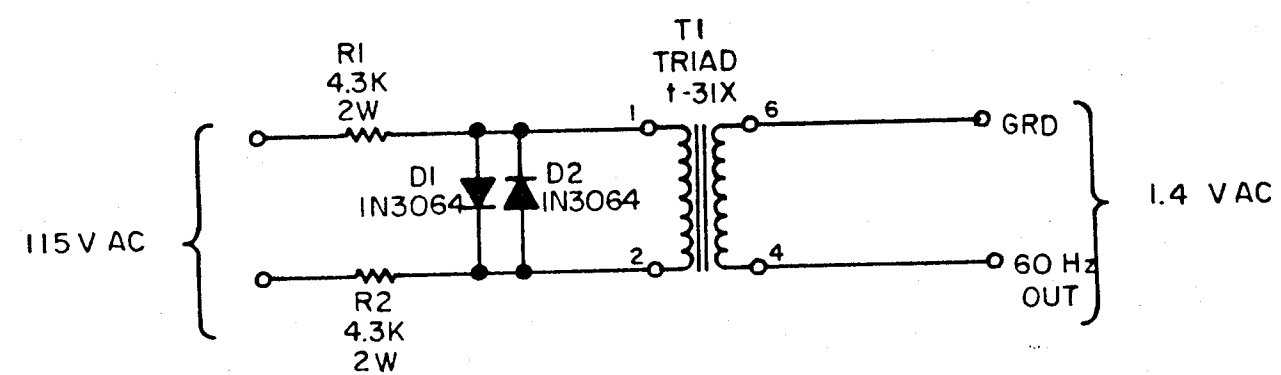


NOTE:
ALL RESISTORS ARE 1/4W ± 5%, UNLESS OTHERWISE SPECIFIED.
* SELECT MC1595's FOR BEST AC NULL. INSTALL SOCKETS FOR IC 4, 6, 9, 11.

		COMPUTER IMAGE CORPORATION		2475 W 2nd AVE DENVER, COLORADO 80223.	
SCALE	NONE	REVISION		BY	DATE
DATE	1-11-72				
DR'N	E.R.	CK'D.			
AP'VD.					
TITLE SIGNAL ROTATION			J11		NO. SM-136 B

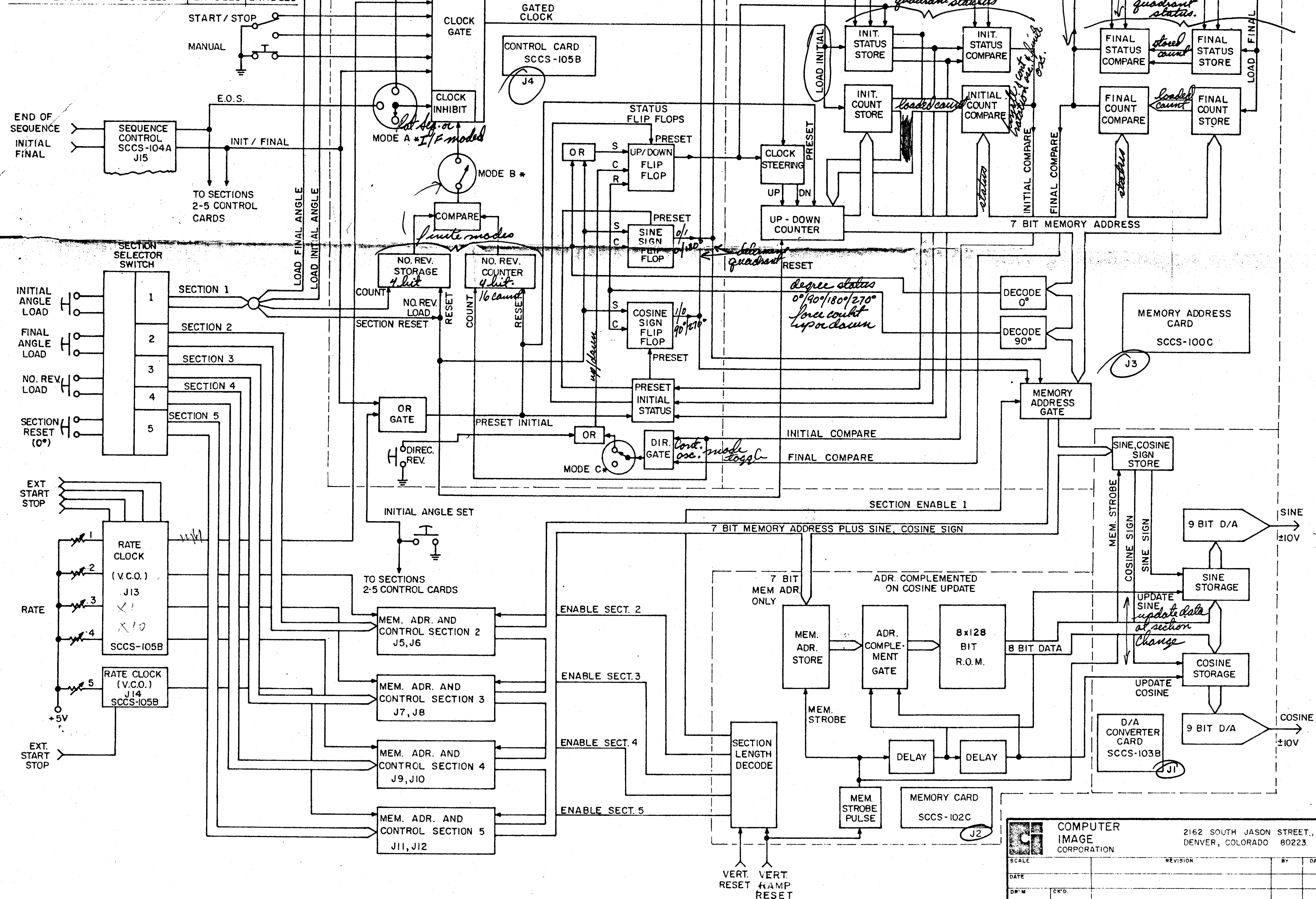


	COMPUTER		5245 W. 2nd. AVE.	
	IMAGE		DENVER, COLORADO	
CORPORATION		80123		
SCALE	REVISION		BY	DATE
NONE	Remote start box		DWS	2-
DATE	12-10-71			
DR'M	CK'D.			
E.R.				
AP-VO				
TITLE	SEQUENCE CARD		J34 INC	SM-138A

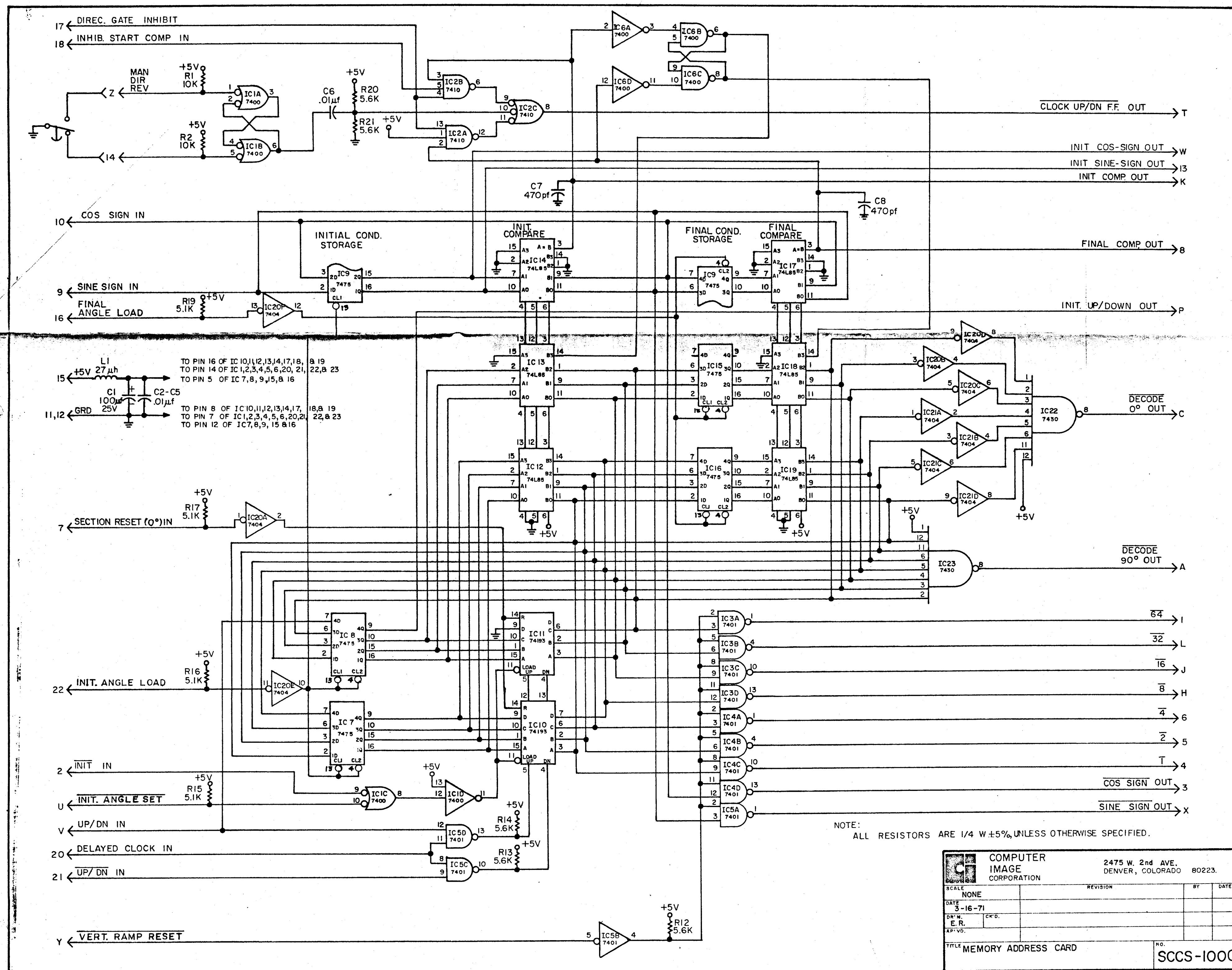


 COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223	
		SCALE NONE	REVISION
DATE 8-31-71			
DR'N E. R.	CK'D.		
AP'VD.			
TITLE 50/60 Hz REFERENCE		NO. SM-137	

MODE SWITCH	(A)	(B)	(C)
* 1. OFF - CLOCK GATE INHIBITED			
2. INIT TO FINAL - FINAL COMP. STOPS CLOCK	DISABLED	DISABLED	DISABLED
3. ROTATION SEQUENCE - EOS STOPS CLOCK	DISABLED	DISABLED	DISABLED
4. FINITE ROTATION - DISABLED	ENABLED	DISABLED	DISABLED
5. CONTINUOUS OSC. - DISABLED	DISABLED	ENABLED	ENABLED
6. FINITE OSC. - DISABLED	ENABLED	ENABLED	ENABLED

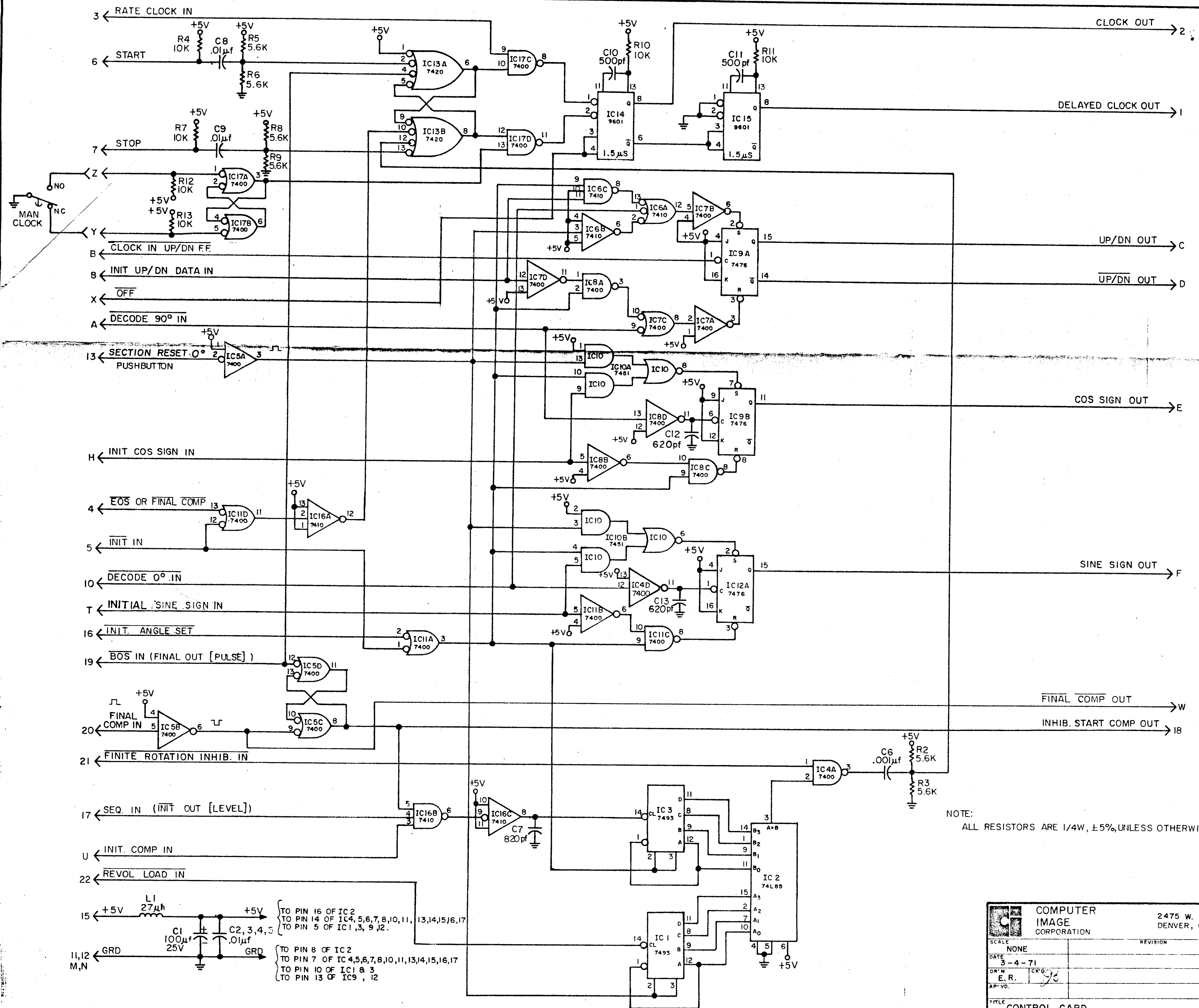


COMPUTER IMAGE CORPORATION		2162 SOUTH JASON STREET., DENVER, COLORADO 80223.	
SCALE	REVISION	BY	DATE
DATE			
DR'M	CK'D		
AP'VD			
TITLE ROTATION CONTROLLER BLOCK DIAGRAM		NO. SCCS-B-100	



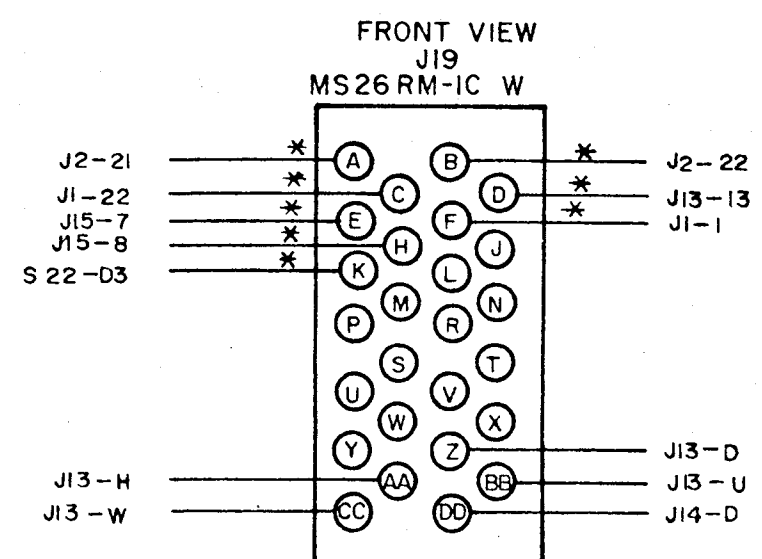
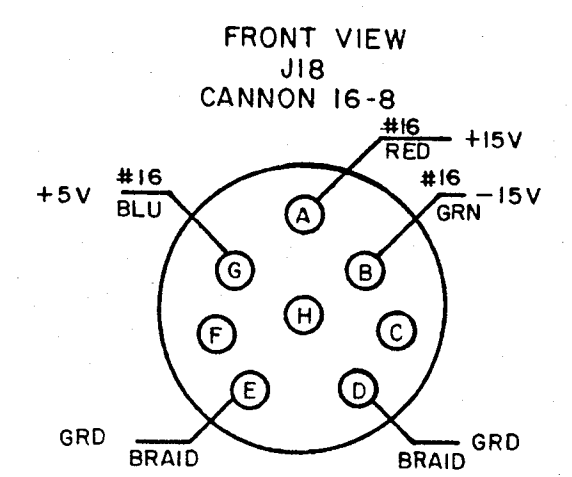
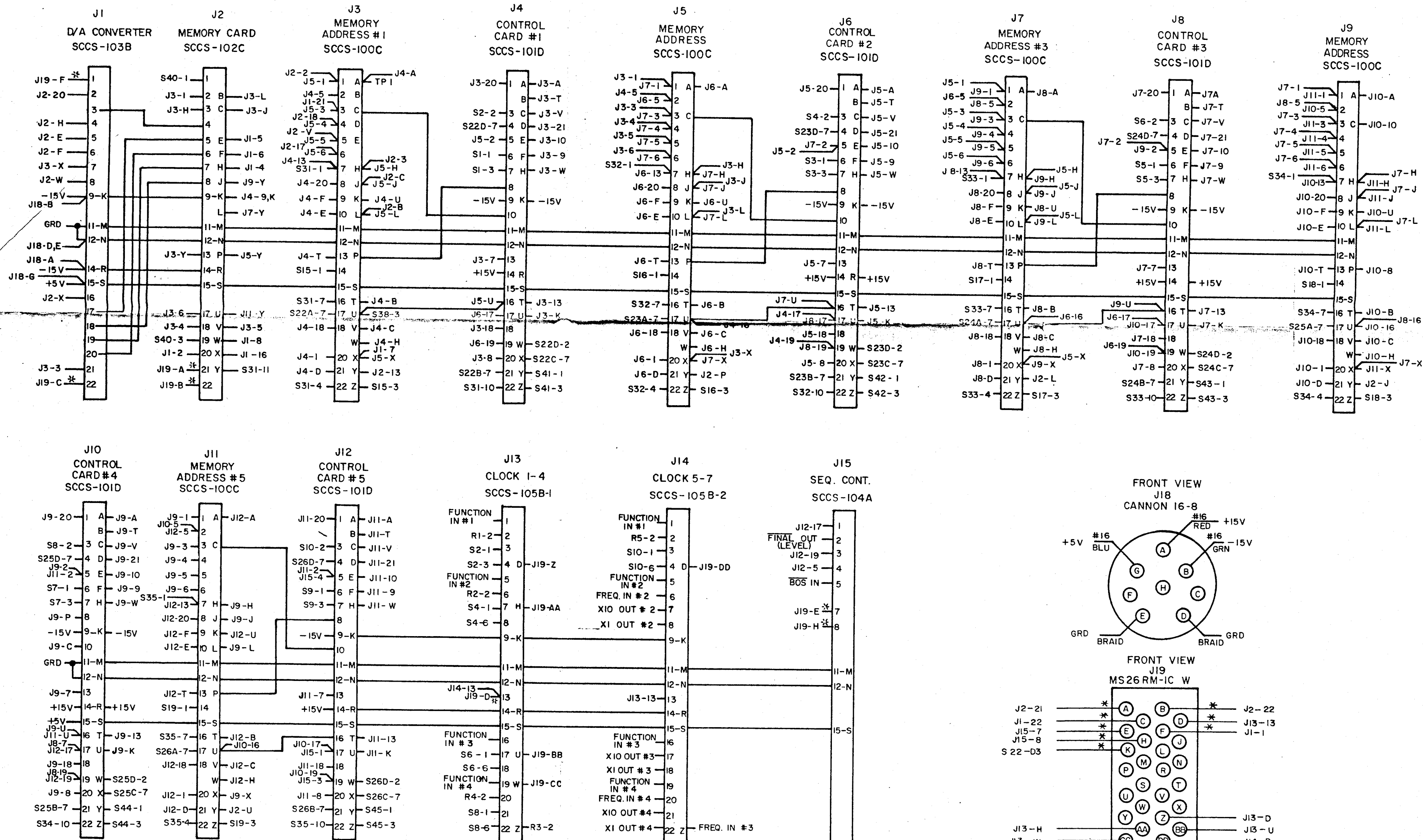
NOTE: ALL RESISTORS ARE 1/4 W ±5%, UNLESS OTHERWISE SPECIFIED.

COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223.	
SCALE NONE	REVISION	BY	DATE
DATE 3-16-71	DR'N. E.R.		
AP'VD.			
TITLE MEMORY ADDRESS CARD		NO. SCCS-100C	



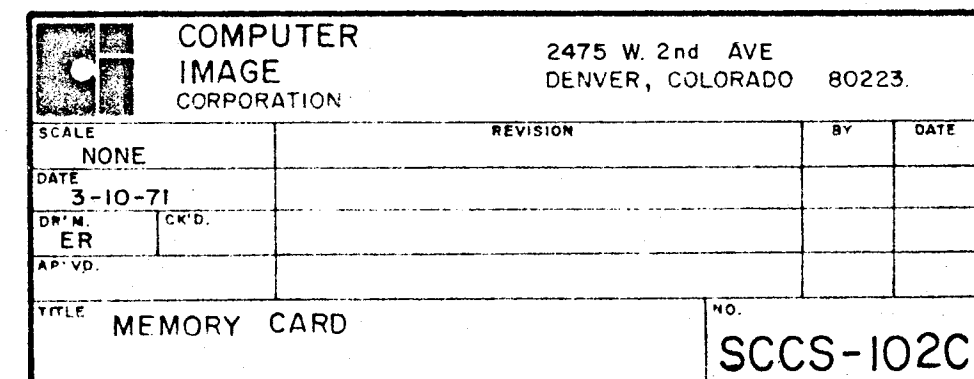
NOTE:
ALL RESISTORS ARE 1/4W, ±5%, UNLESS OTHERWISE SPECIFIED

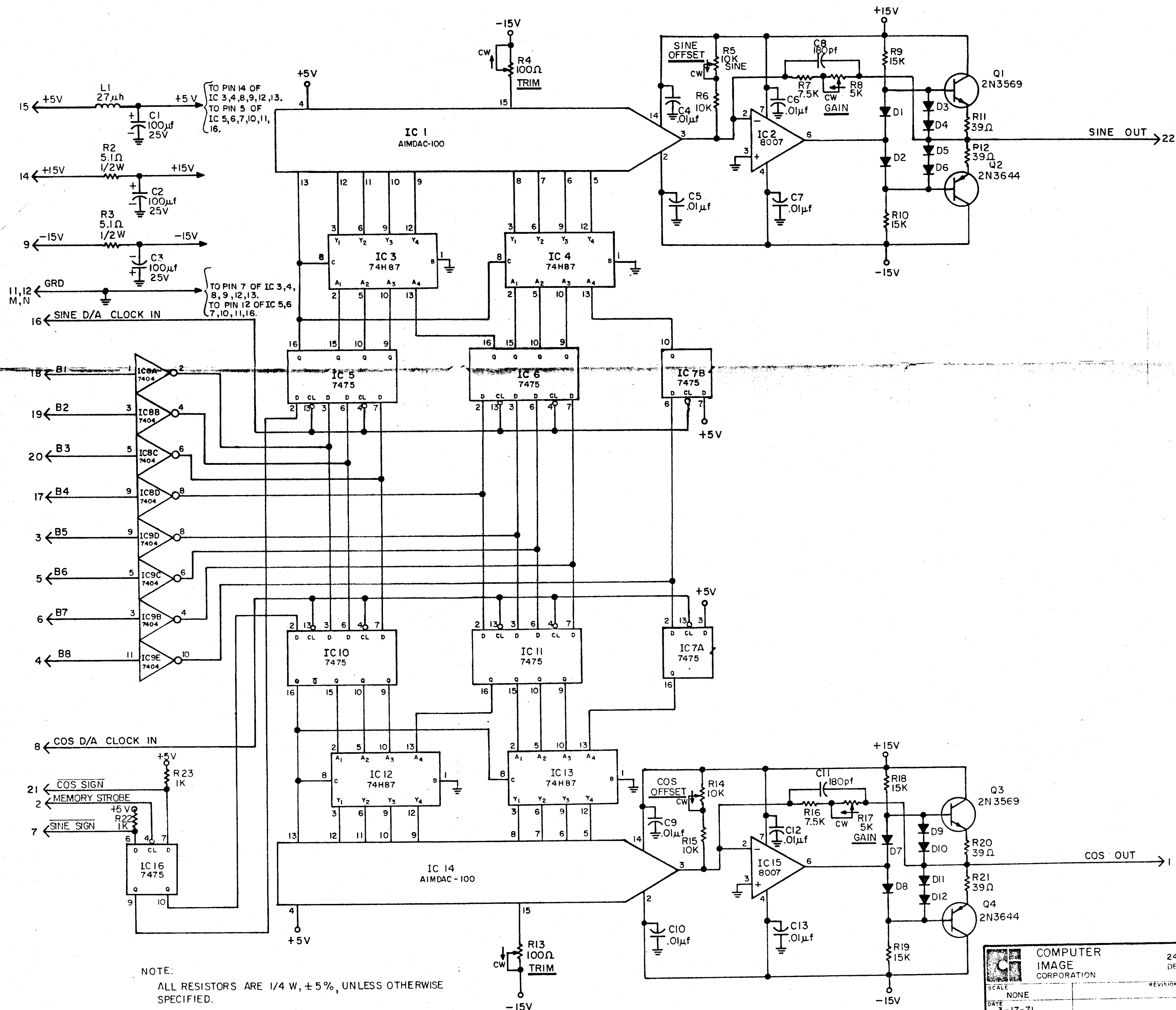
COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REVISION	
DATE	3-4-71	BY	
DR'N	E.R.	CHK'D	
TITLE		NO	
CONTROL CARD		SCCS-101D	



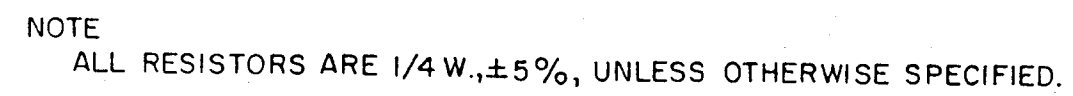
NOTE:
* INDICATES COAX

		COMPUTER IMAGE CORPORATION		2475 W. 2nd. AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REVISION	REV	BY	DATE
DATE	1-3-72			R.K.P	27/73
DR'M	CK'D.				
E.R.					
AP'D.					
TITLE				ROTATION CONTROLLER WIRING DIAGRAM	
JNC				SCCSW-100	

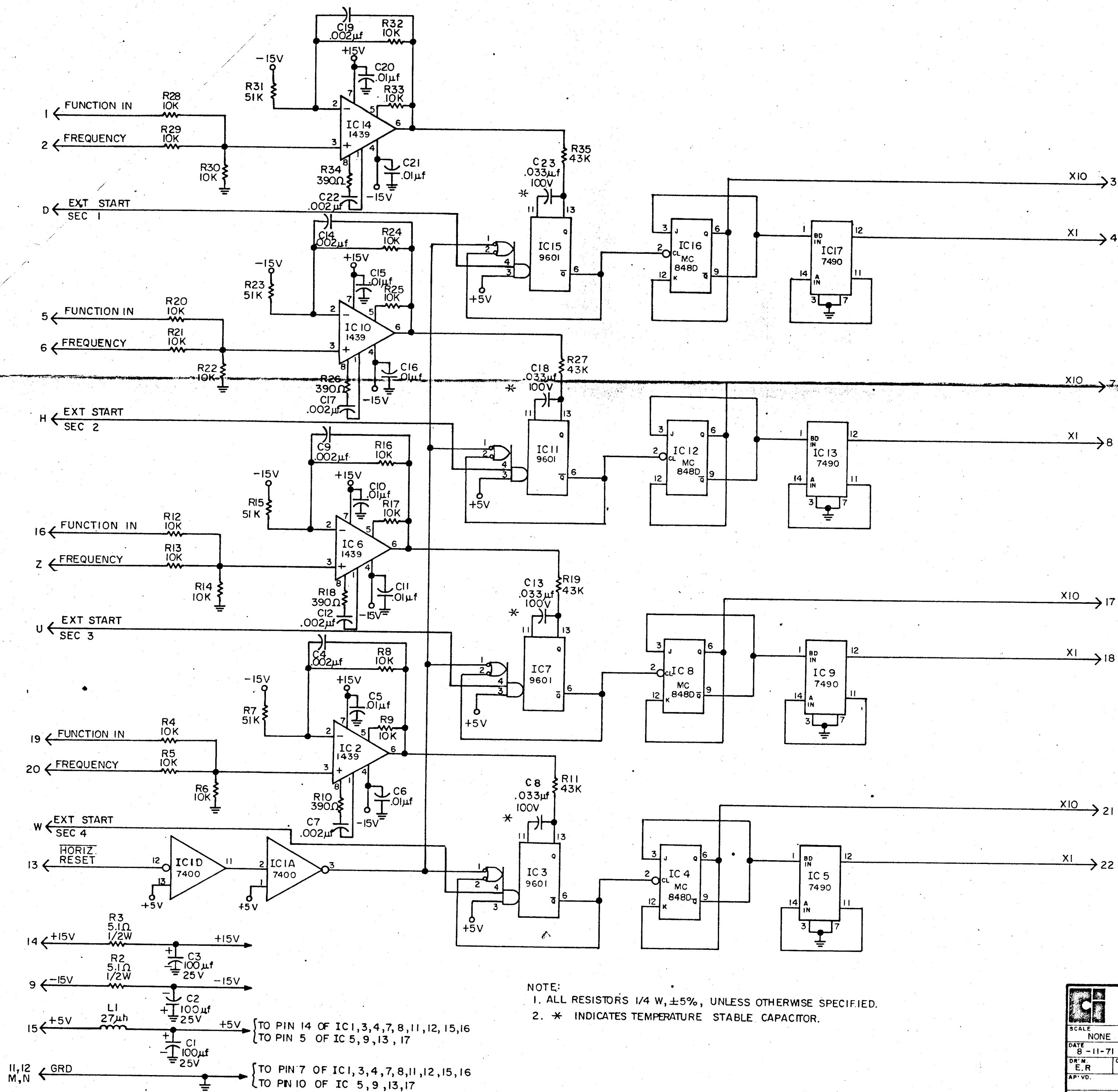


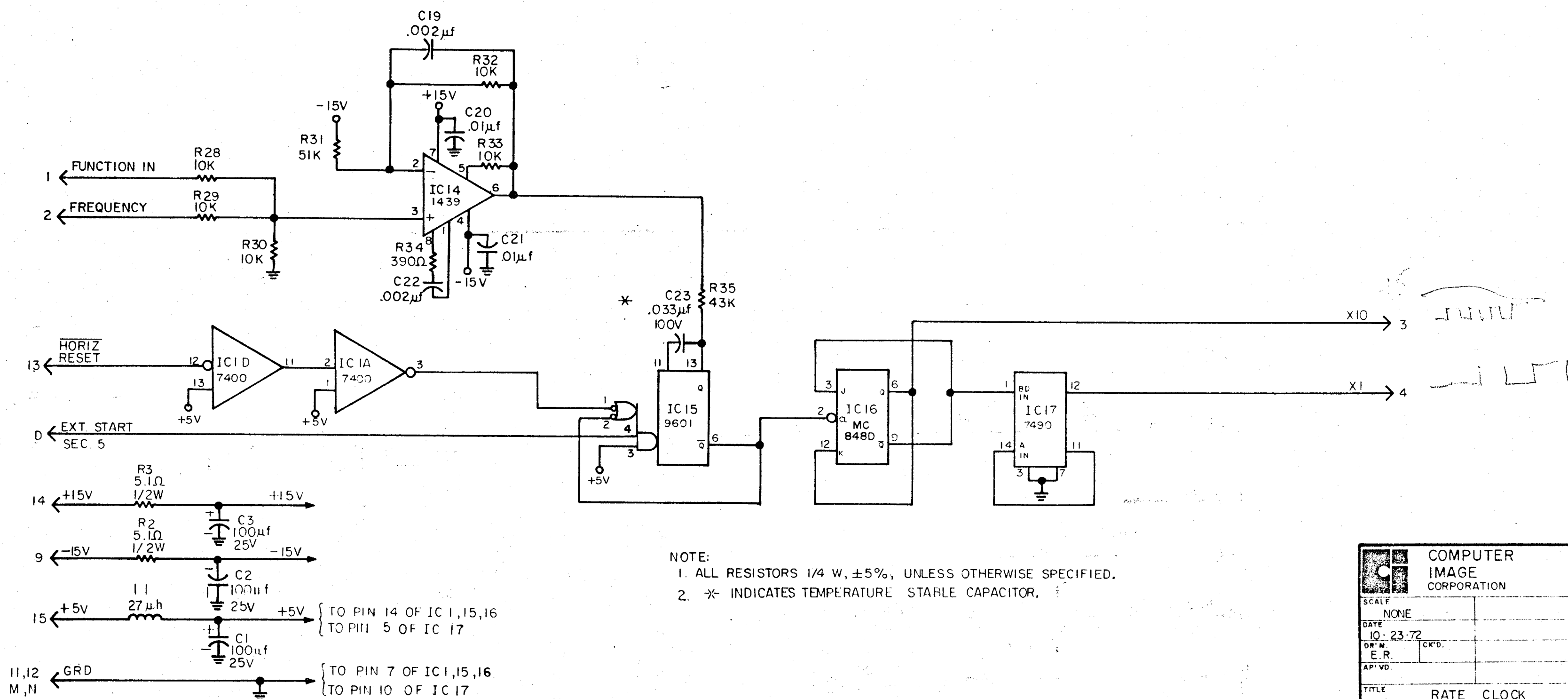


COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REVISION	
DATE	3-17-71	BY	
DR'W	E.R.	CHKD.	
AP'VE			
TITLE D/A CONVERTER SINE - COSINE GEN.			NO. SCCS-103B



	COMPUTER		2475 W. 2nd AVE.	
	IMAGE		DENVER, COLORADO	
CORPORATION		80223.		
SCALE	REVISION		BY	DATE
NONE				
DATE				
3-3-71				
DR'M	CK'D			
E.R.				
AP'VD				
TITLE	SEQUENCE CONTROL		NO.	





COMPUTER IMAGE CORPORATION		2475 W 2nd AVE DENVER, COLORADO 80223	
SCALE NONE	REVISION	REV	BY R.K.P.
DATE 10-23-72	CK'D.		DATE 12/4/73
DR'N E.R.			
AP'VD.			
TITLE RATE CLOCK (VOLTAGE CONTROLLER OSCILLATOR)		NO SCCS-105 B-2	

Rack #5 Monitor Power

SMW-204-1

1X-Y Deflection Amp. Wiring Diagram
X-or Y Deflection Amp. SchematicSMW-203
SM-i22C-1**2**Monitor Drawer Wiring Diagram
Monitor High Voltage Power Supply
Monitor Focus Current Rey, Blanking & Video Amp.
CRT Sacket BoardSMW-202-1
SM-12Y
SM-139
SM-143**3**Monitor Video Processor Wiring Diagram
Gray Level Switches
Gray Level Encoder Vider AMPS, Monitor
Gray Level Multiplexer
Threshold Control, Video Processor
2X1 Video Switch
Level Detectors, Video Processor
Mon. Pincushion Correction Gen.
Mon. Yoke Comp S Pincushion AdderCVSW-102-2
CVS-111
CVS-112A
CVS-114A
CVS-115
CVS-121-2
CVS-125
CVS-127
CVS-128**4**

36 Volt Regulator

SM-111A

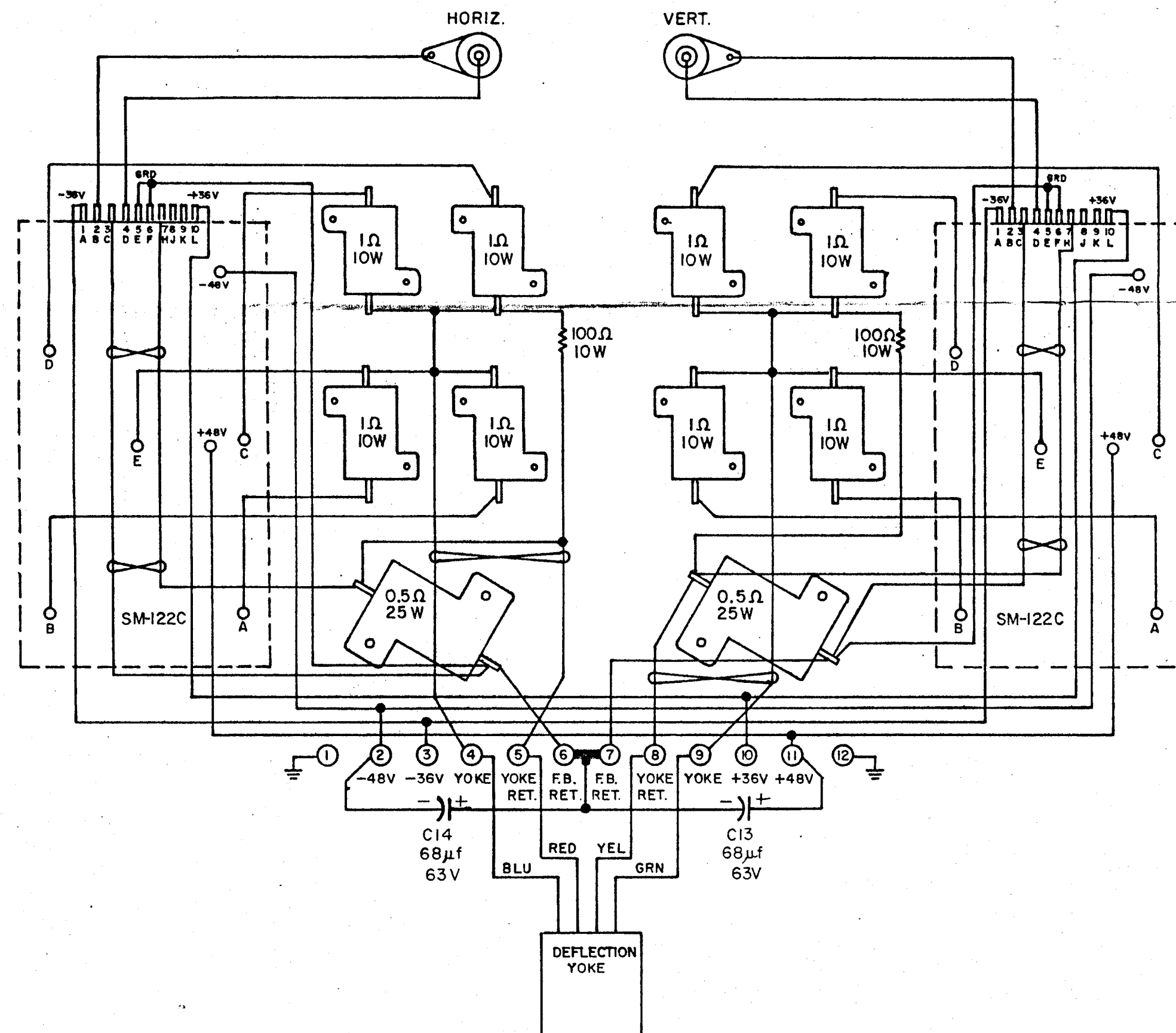
5Camera Control Wiring Diagram
Camera Head Wiring Diagram
Camera Blanking S Protection
? Dynamic Correction
Dual Ramp Generator
Camera Yoke Driver
Focus Coil Current Regulator
Camera High Voltage Power Supply
Video Pre-Amp
? Pincushion MultiplierSMW-300A
SMW-301B
SM-109
SM-112C
SM-113D
SM-117E
SM-119
SM-121A
SM-126H
SM-141**6**

Rack #6 S #7 Wiring Diagram

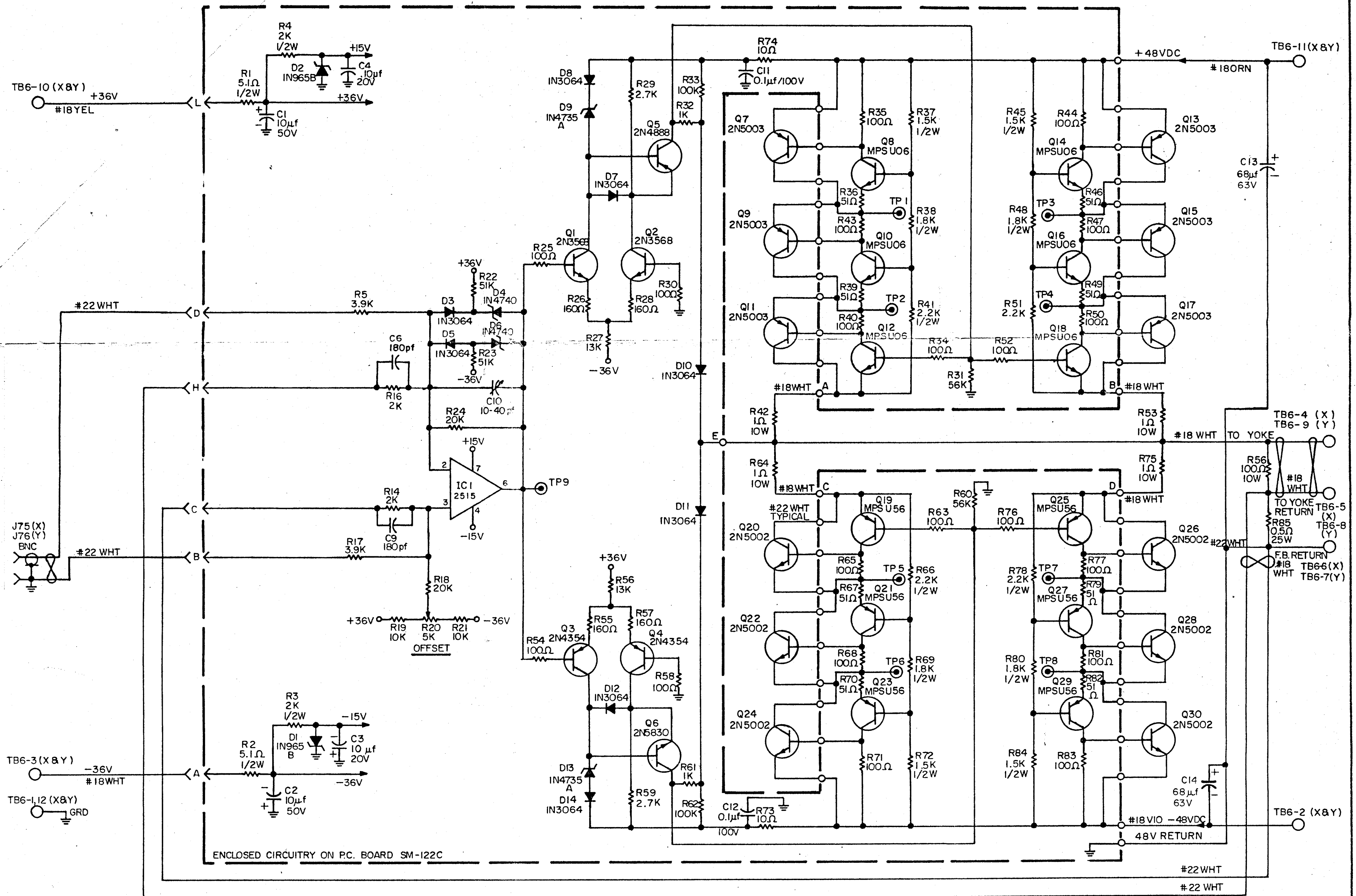
Switcher

SMW-302

7System Monitor Drawer Wiring
SYNC or SimulatorSMW-108
SM-125**8**



 COMPUTER IMAGE CORPORATION		2475 W. 2nd. AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REVISION	BY DATE
DATE	12-14-71		
DR'N	E.R.	CK'D.	
AP'VD.			
TITLE X-Y DEFLECTION AMPLIFIER WIRING DIAGRAM			NO. SMW-203



HEAT SINK
ASTRODYNE -2404-4

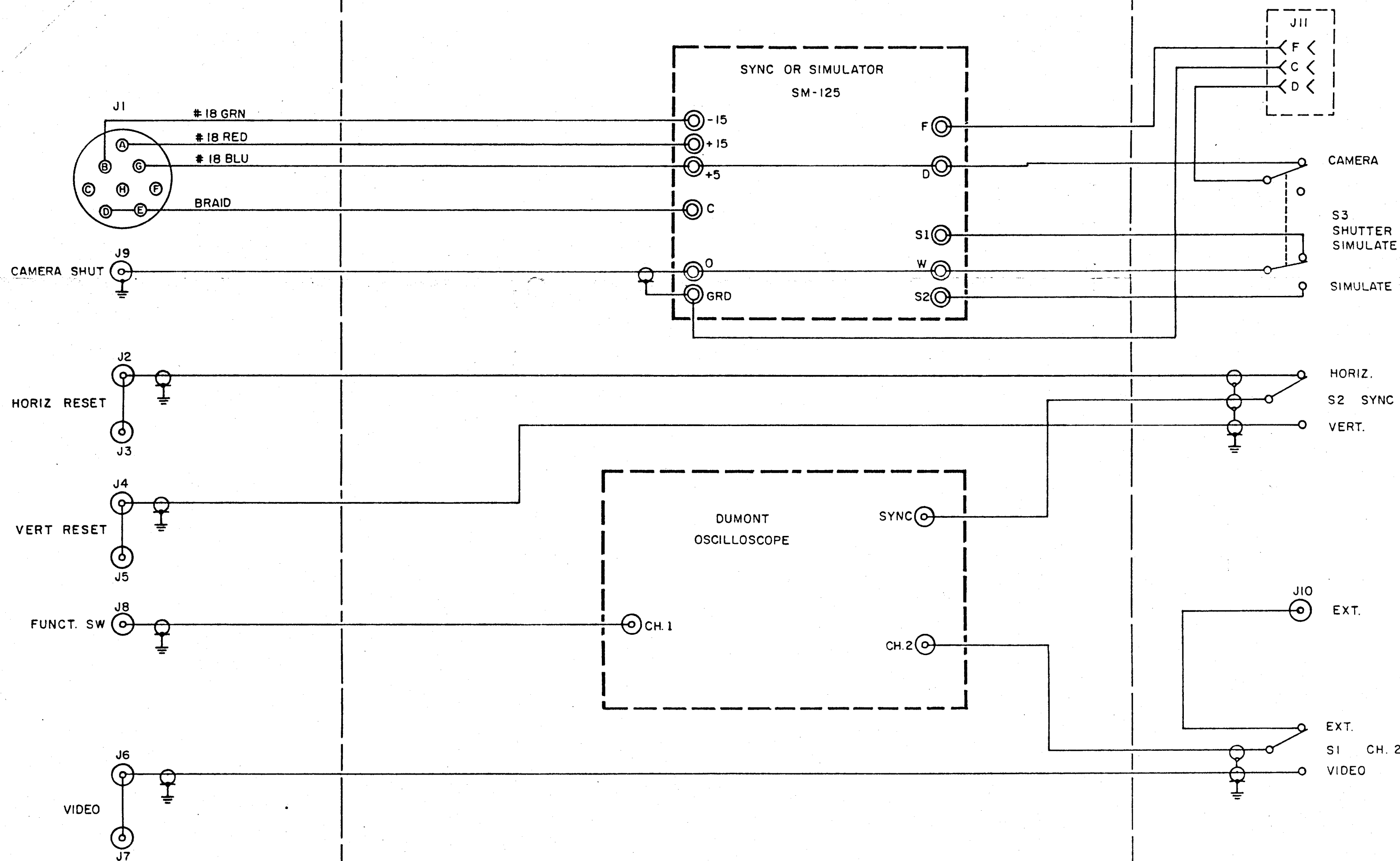
LIN 1 T.C. 100-600 μ S
LIN 1A AMP
2 T.C. 20-120 μ S
2A AMP
3 T.C. 0.5-3 μ S
3A AMP

NOTE:
RESISTORS ARE 1/4W, UNLESS OTHERWISE SPECIFIED.
* OMIT THESE COMPONENTS FOR CAESAR SYSTEM
TWO COMPLETE CIRCUITS REQUIRED FOR ONE X AND Y DEFLECTION UNIT

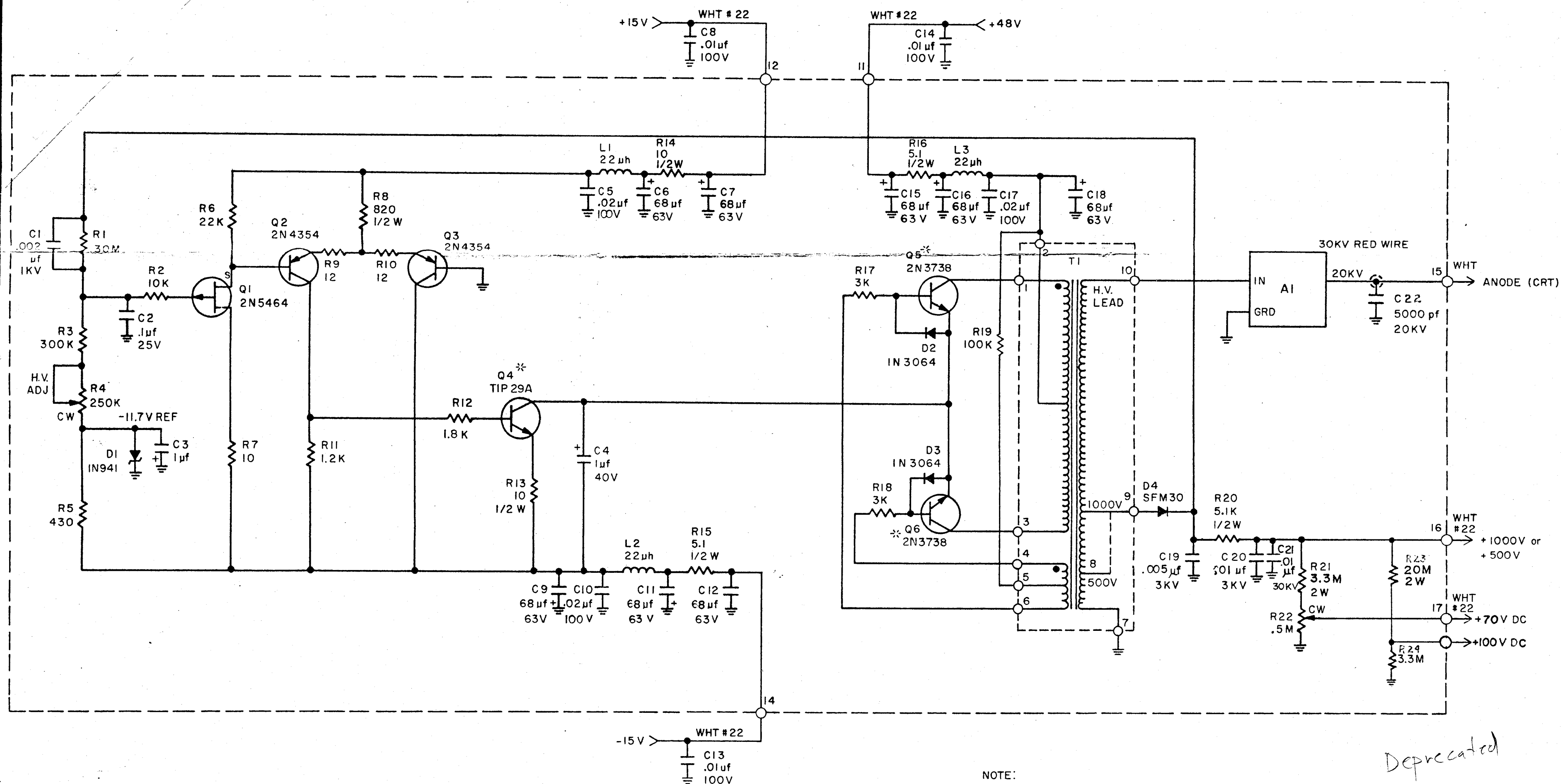
		COMPUTER IMAGE CORPORATION		2475 W. 2ND. AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REVISION		BY	DATE
DATE	9-2-71				2-16-73
DR'N	E.R.	CK'D.			
AP'VD.					
TITLE MONITOR X OR Y DEFLECTION AMPLIFIER SCHEMATIC					NO. SM-122C-1

BACK PANEL

FRONT PANEL



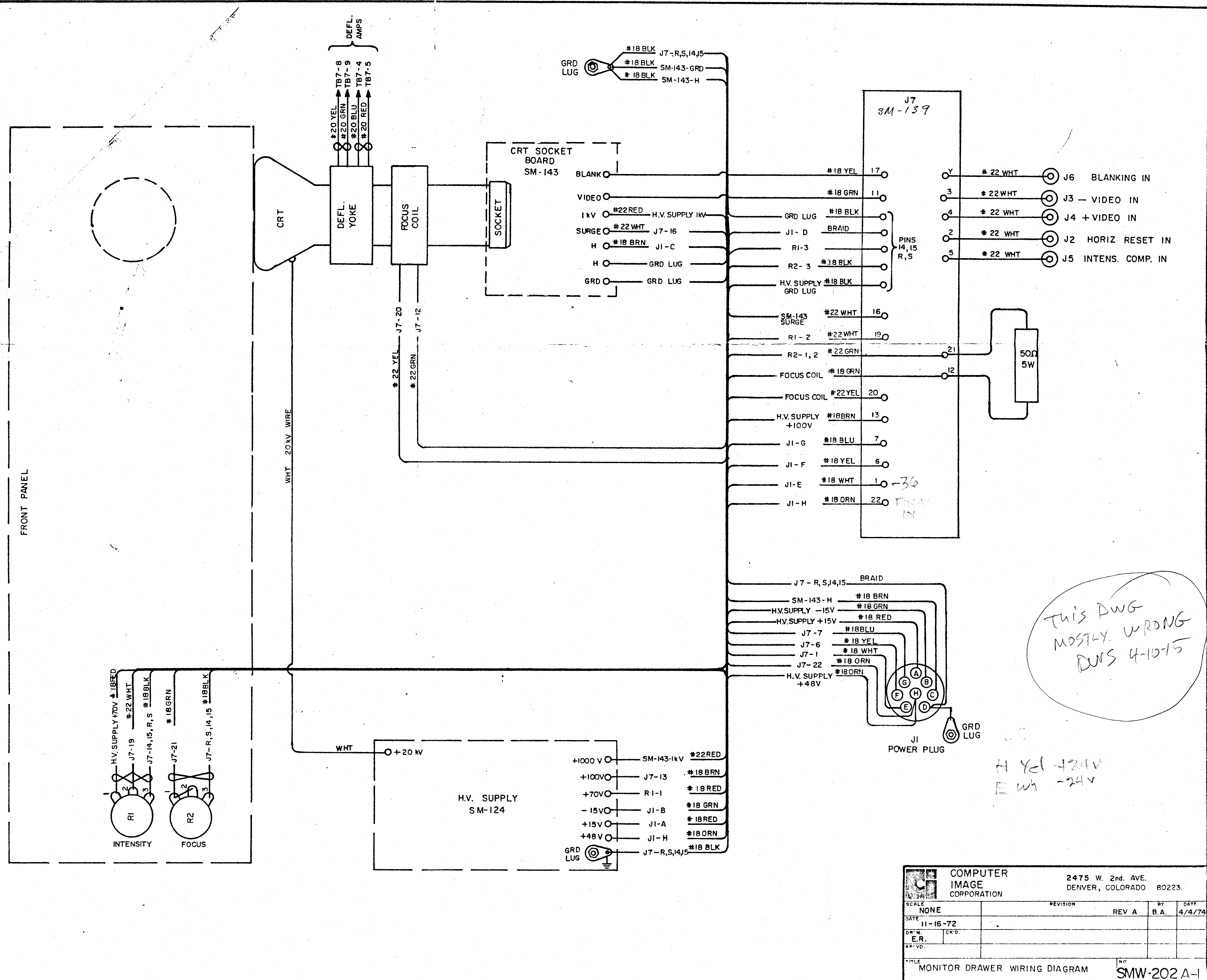
		COMPUTER IMAGE CORPORATION		2475 W. 2nd. AVE. DENVER, COLORADO 80223	
SCALE	REVISION			BY	DATE
DATE 11-14-72					
DRM Mack	CK'D				
APVD					
TITLE SYSTEM MONITOR DRAWER WIRING				NO. SMW-108	



NOTE:
 TRANSFORMER LEADS 1 THRU 6 ARE * 22 WHITE.
 * Q4, Q5, Q6 ARE MOUNTED ON CHASSIS WITH MK-25 MOUNTING KIT.
 ALL RESISTORS $\pm 5\%$ 1/4W UNLESS OTHERWISE SPECIFIED.

Deprecated

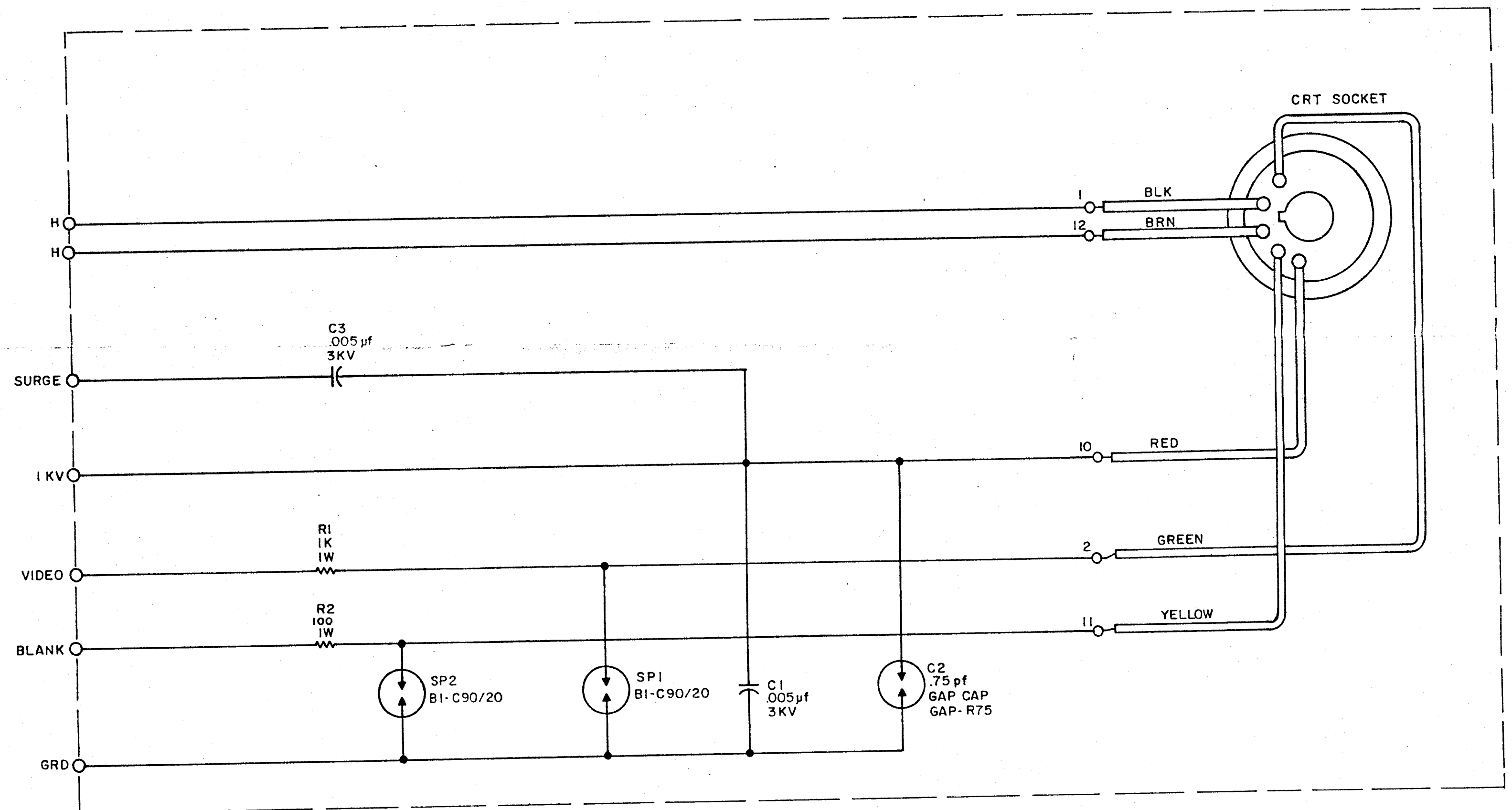
		COMPUTER IMAGE CORPORATION		2162 SOUTH JASON STREET, DENVER, COLORADO 80223.	
SCALE		REVISION		BY	DATE
DATE					2-16-73
DR'W.	CK'D.				
AP'VD.					
TITLE MONITOR HIGH VOLTAGE POWER SUPPLY AND REGULATOR					NO. SM-124



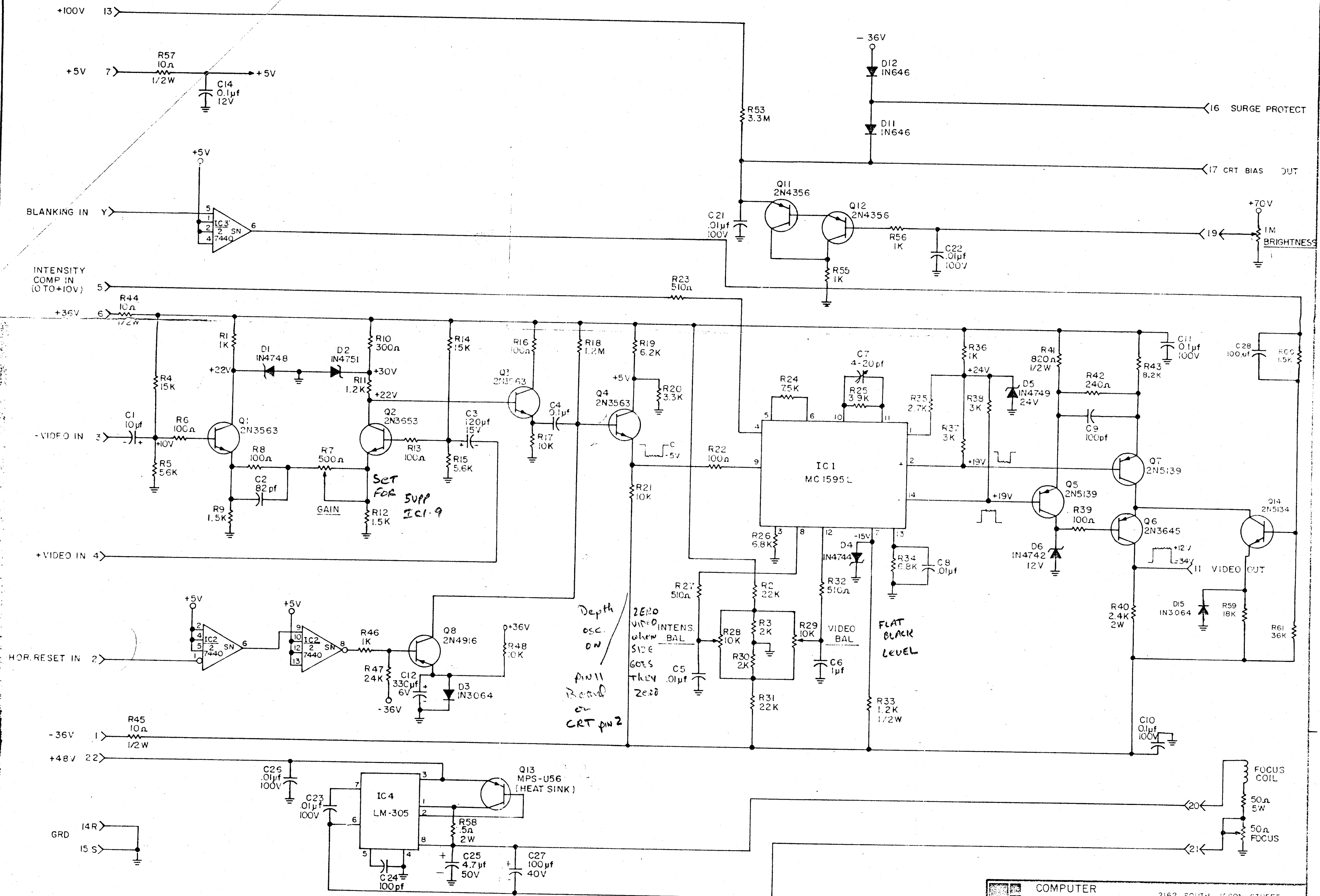
THIS DWG
MOSTLY WRONG
DWS 4-10-75

H YEL +24V
E WH -24V

		COMPUTER IMAGE CORPORATION		2475 W. 2nd. AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REVISION	REV A	BY	DATE
DATE	11-16-72				4/4/74
DR'N	E.R.	CK'D.			
AP'VD.					
TITLE MONITOR DRAWER WIRING DIAGRAM				NO SMW-202 A-1	

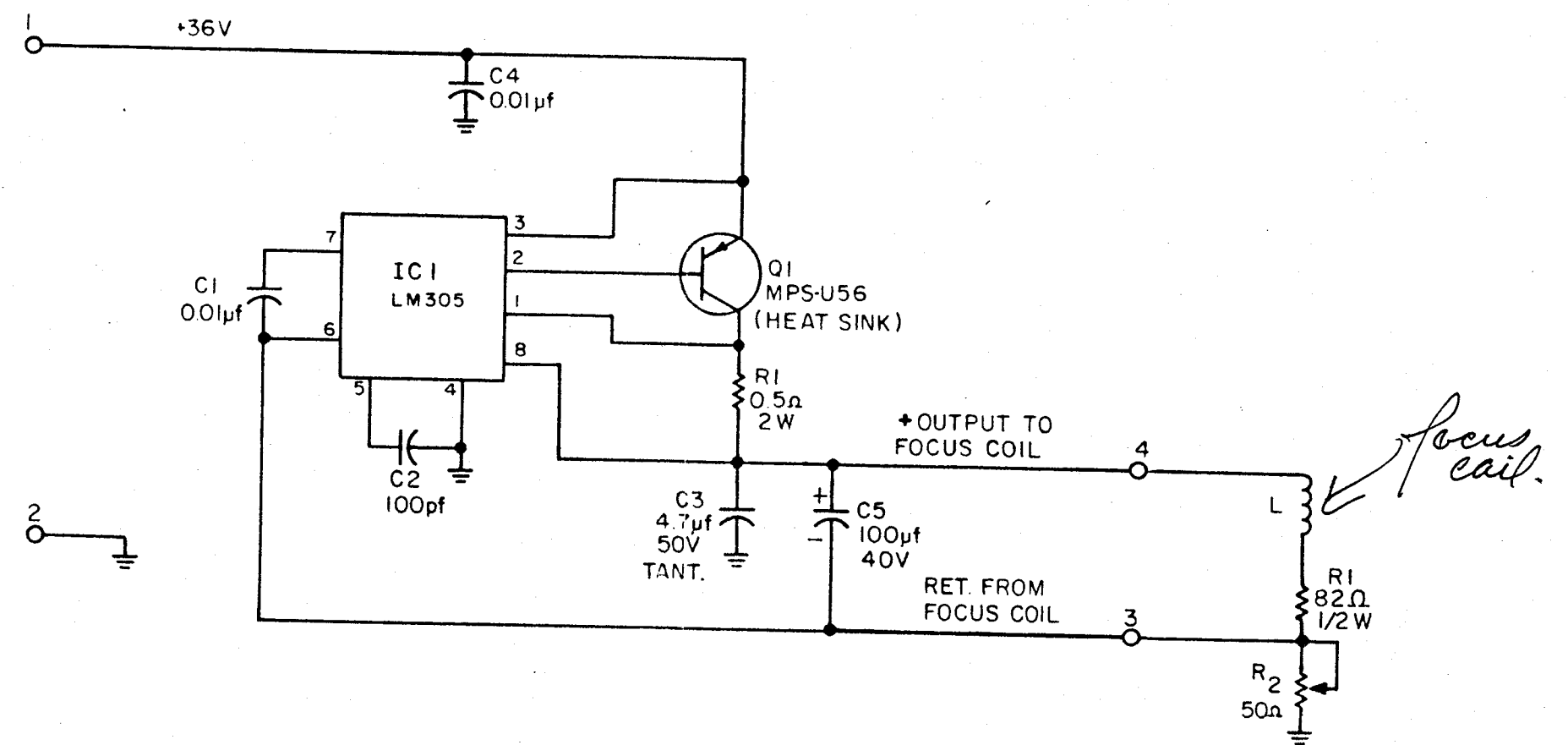


 COMPUTER IMAGE CORPORATION		2162 SOUTH JASON STREET, DENVER, COLORADO 80223.	
SCALE	REVISION	REV	DATE
DATE 10-21-72			4/4/74
DR'N. <i>WACK</i>	CR'D.		
AP'VD.			
TITLE CRT SOCKET BOARD			NO. SM-143

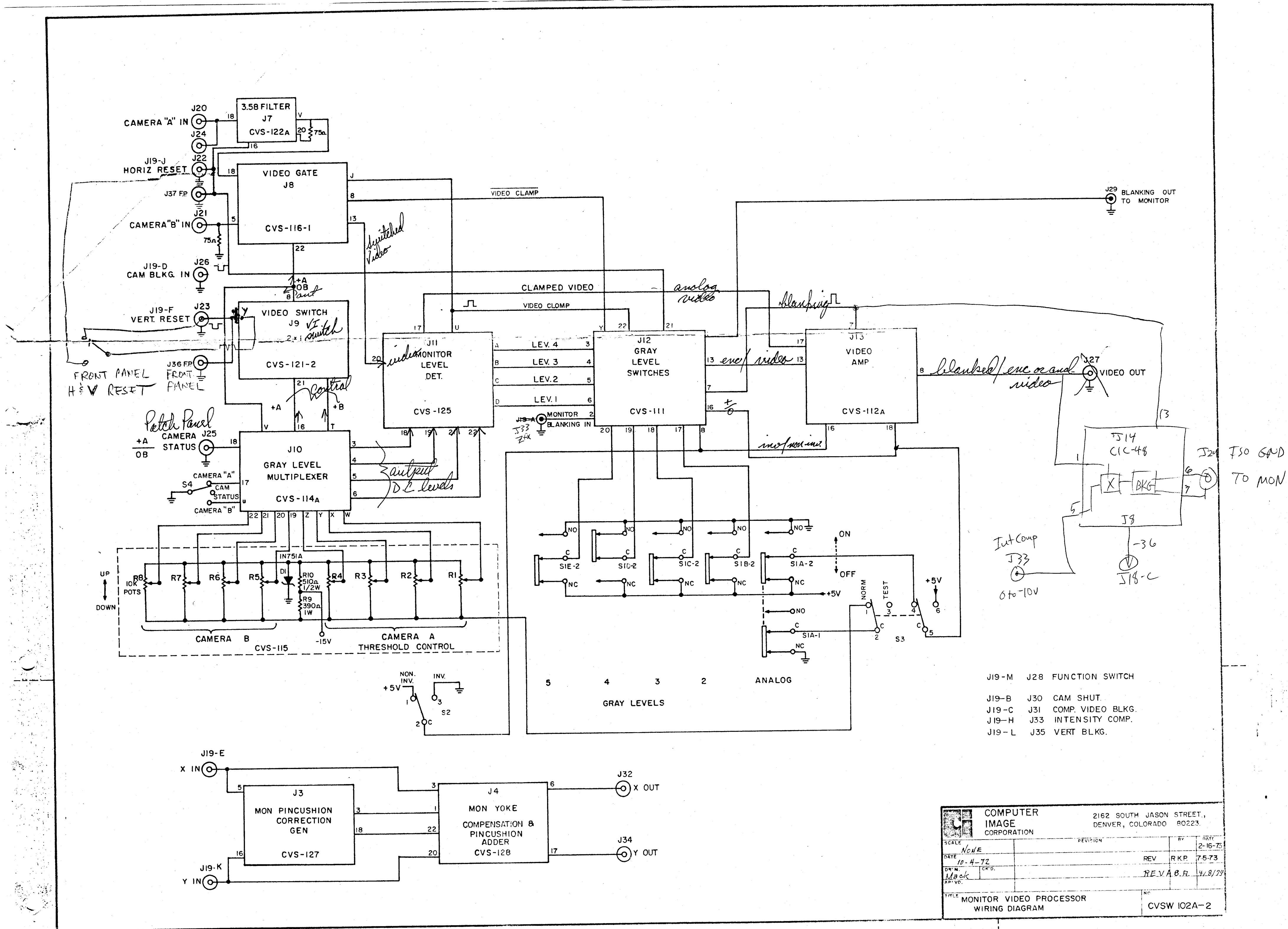


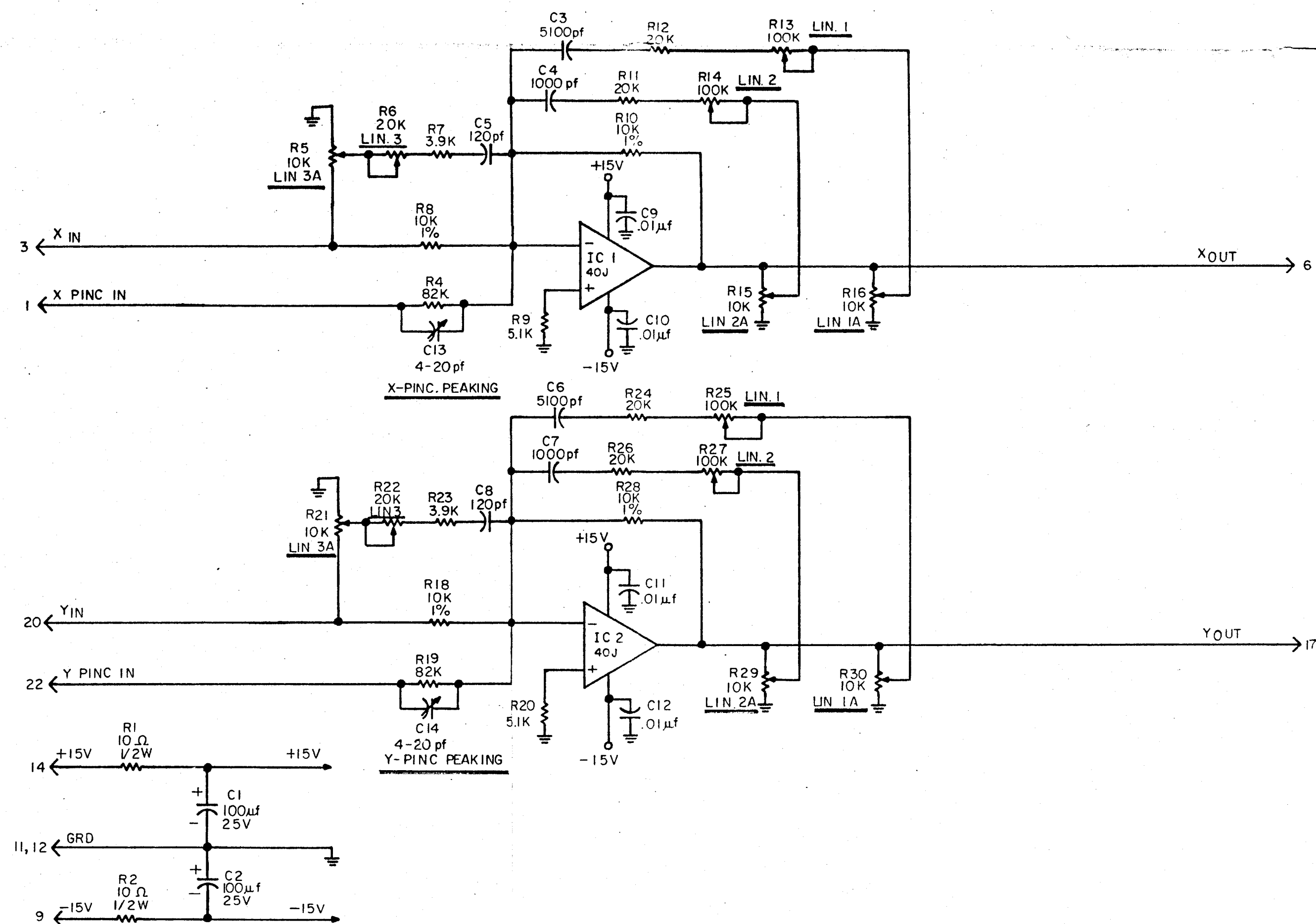
NOTES
1. ALL RESISTORS ARE 1/4W, ± 5% UNLESS OTHERWISE SPECIFIED.

COMPUTER IMAGE CORPORATION		2162 SOUTH JASON STREET DENVER, COLORADO 80223	
SCALE	REVISION	BY	DATE
DATE 10-20-72			2-16-73
CMW			ER 4-14-73
ADVP			
MONITOR FOCUS COIL CURRENT REG. BLANKING AND VIDEO AMP.		REV A	B.A. 4/4/74
		SM-139A	



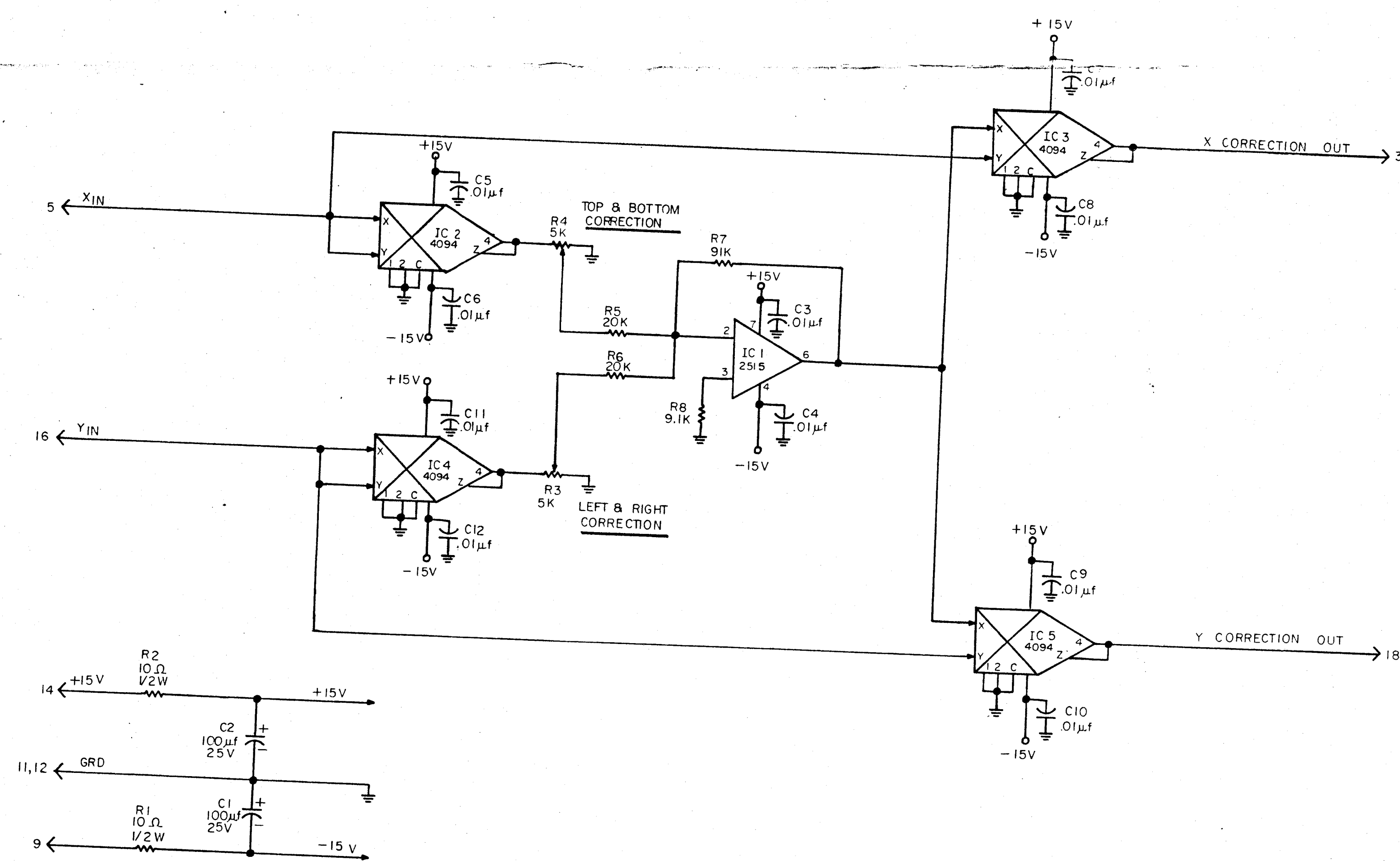
 COMPUTER IMAGE CORPORATION		2475 W. 2nd. AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REVISION	BY
DATE	2-2-70		DATE
DR. M. E. R.	CK'D.	ON SM137A BOARD	
AP'VD.			
TITLE		NO.	
FOCUS COIL CURRENT REGULATOR		SM - 119	





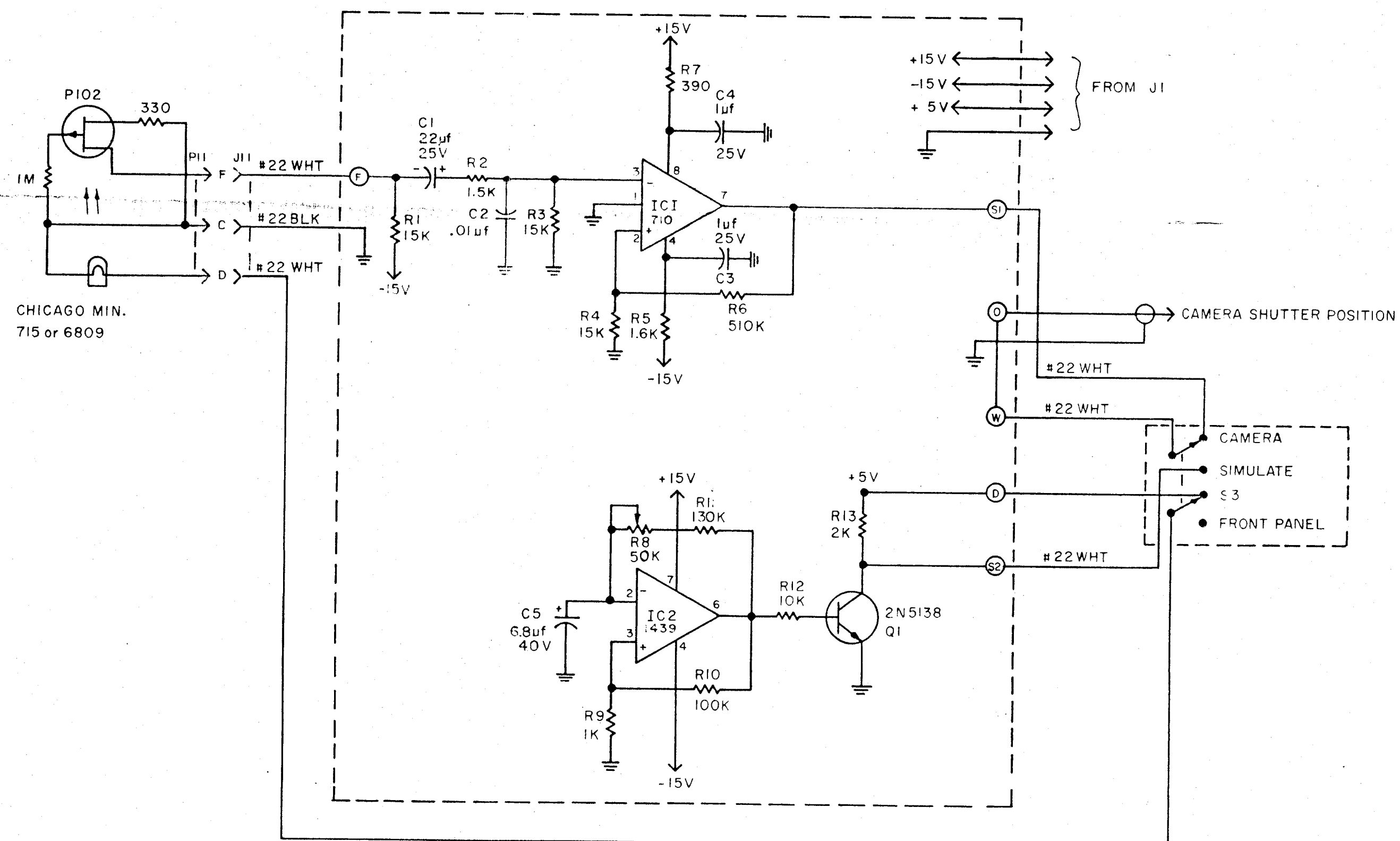
J4

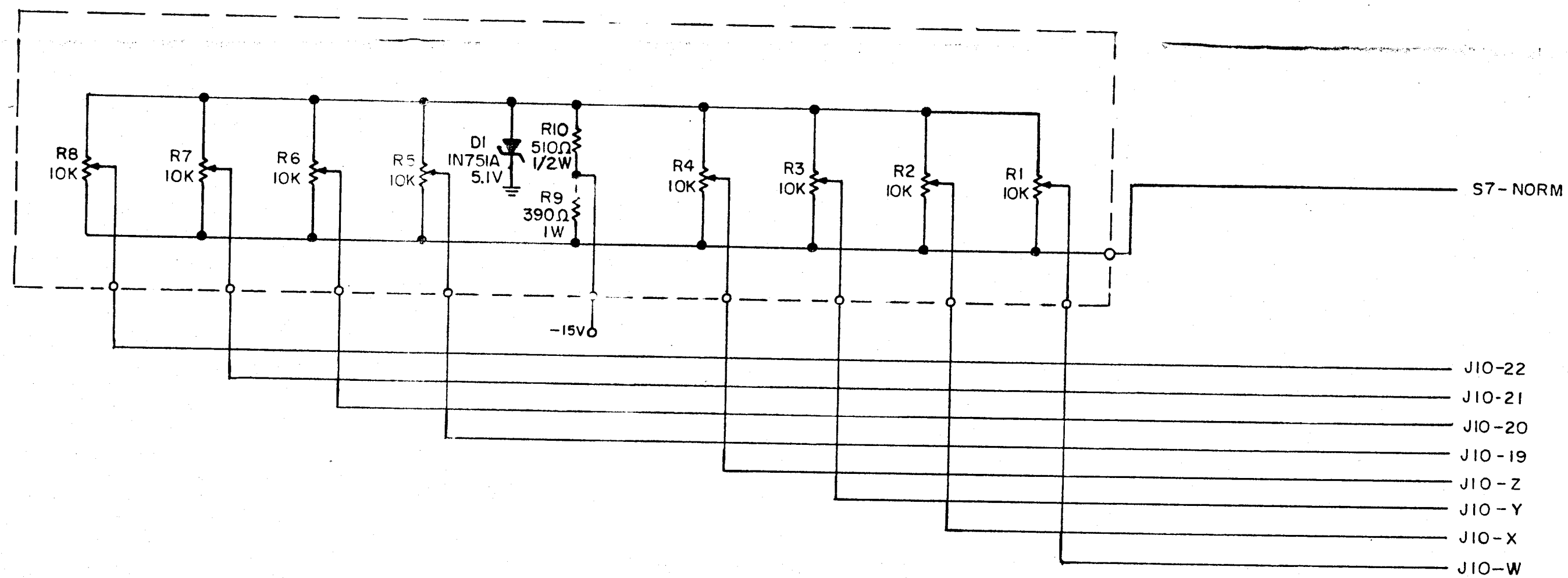
COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223	
SCALE	NONE	REVISION	
DATE	10-19-72	BY	
DR'N	E. R.	CK'D.	
AP'VD.			
TITLE: MON. YOKE COMP. & PINCUSHION ADDER		NO. CVS-128	



53

COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REVISION	
DATE	11-19-72	BY	
DR'N	E.R.	CHK'D	
APP'D			
TITLE		NO.	
MON. PIN CUSHION CORRECTION GENERATOR		CVS-127	



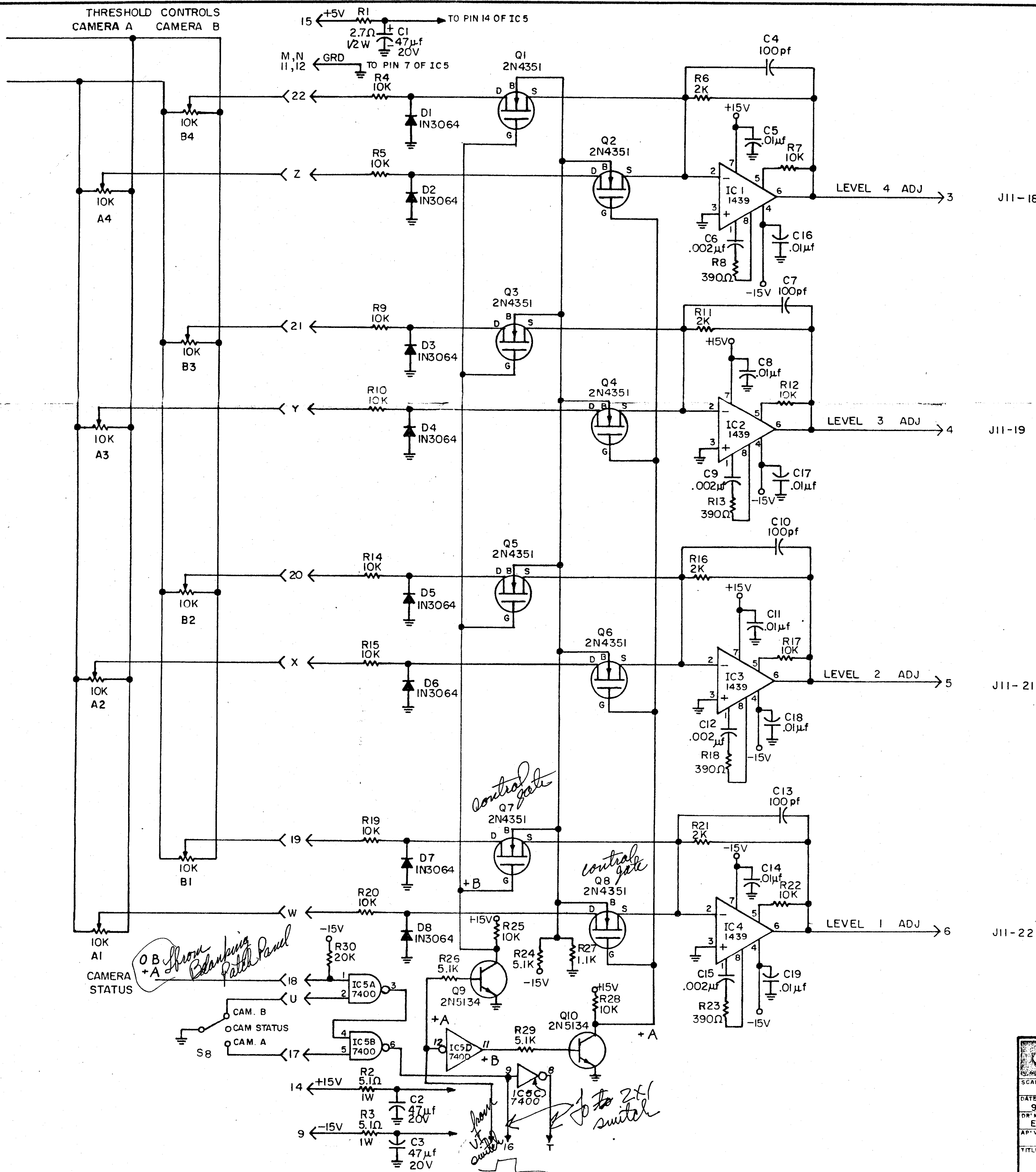


CAMERA B

CAMERA A

on front panel

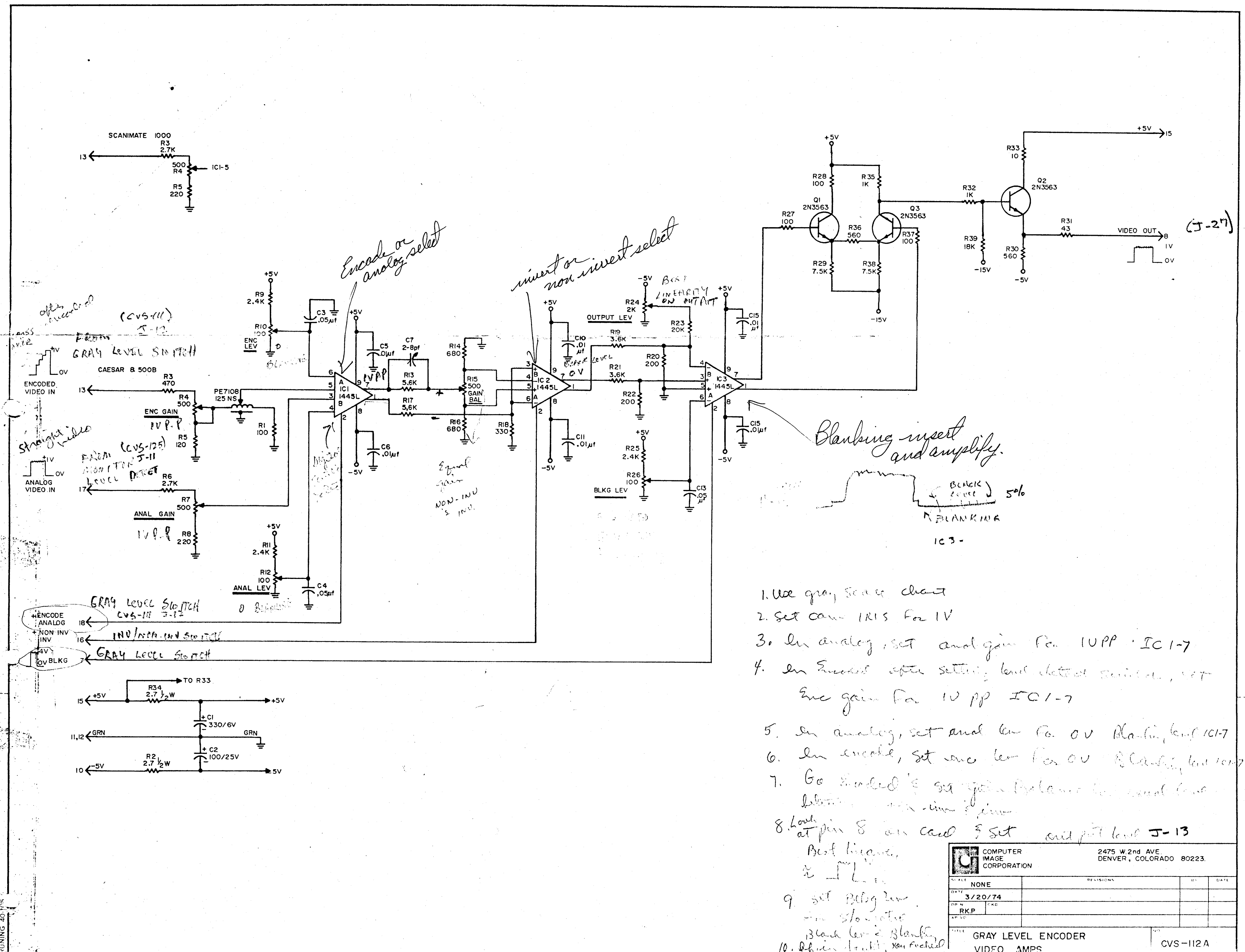
 COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223	
SCALE	NONE	REVISION	BY
DATE	9-20-71		DATE
DR'W	E.R.	CK'D.	
AP'VD.			
TITLE THRESHOLD CONTROL VIDEO PROCESSOR		NO CVS-115	



D.C. levels to level detectors.

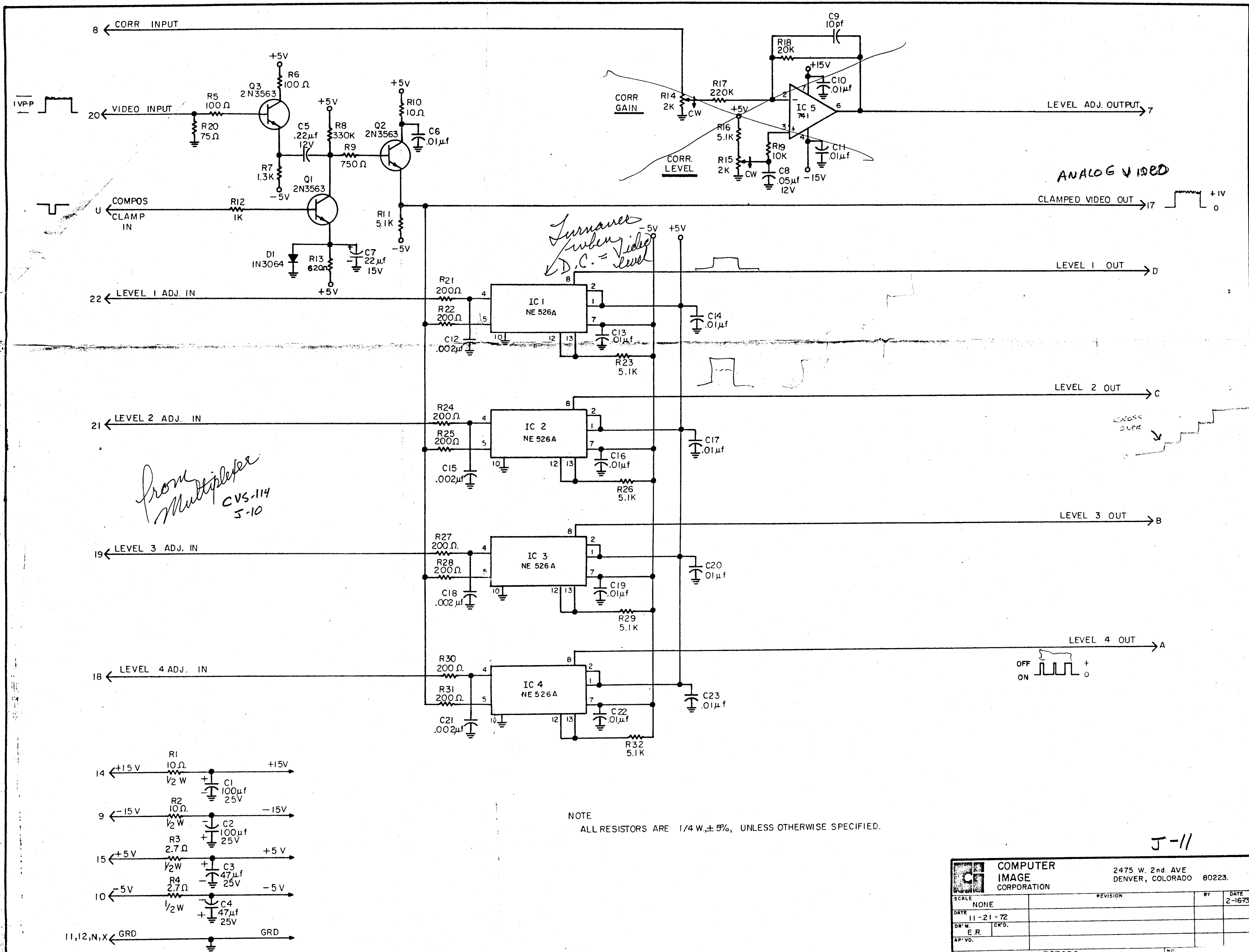
J10

		COMPUTER IMAGE CORPORATION 2475 W. 2nd AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REVISION	BY DATE
DATE	9-20-71		
DR'M	E.R.		
AP'VD.			
TITLE		NO.	
GRAY LEVEL MULTIPLEXER		CVS-114A	



1. Use gray scale chart
2. Set cam-IRIS for 1V
3. In analog, set anal gain for 10 PP IC1-7
4. In encode after setting level detect switch, set enc gain for 10 PP IC1-7
5. In analog, set anal for 0V blanking level IC1-7
6. In encode, set enc for 0V blanking level IC1-7
7. Go encode & set gain balance for level level
8. Look at pin 8 on card & set and put level J-13
9. set Blkg lev
10. Blkg lev, you checked

COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223	
DATE	3/20/74	REV	DATE
BY	RKP	CHK	
TITLE		REV	
GRAY LEVEL ENCODER		CVS-112 A	
VIDEO AMPS			

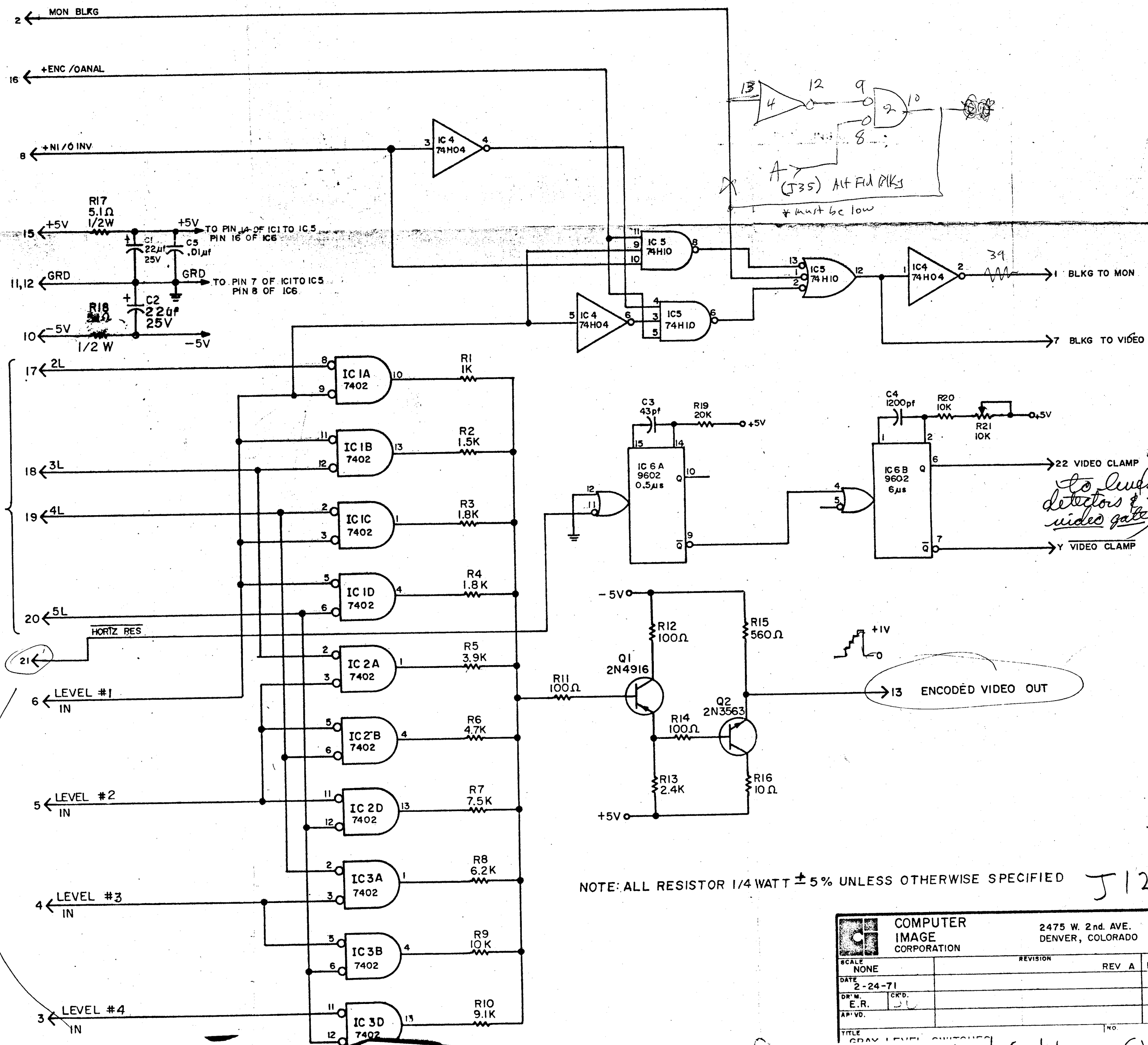


J-11

		COMPUTER IMAGE CORPORATION		2475 W. 2nd. AVE DENVER, COLORADO 80223.	
SCALE	NONE	REVISION		BY	DATE
DATE	11-21-72				2-1673
DR'W.	E.R.	CK'D.			
AP'VD.					
TITLE LEVEL DETECTORS VIDEO PROCESSOR					

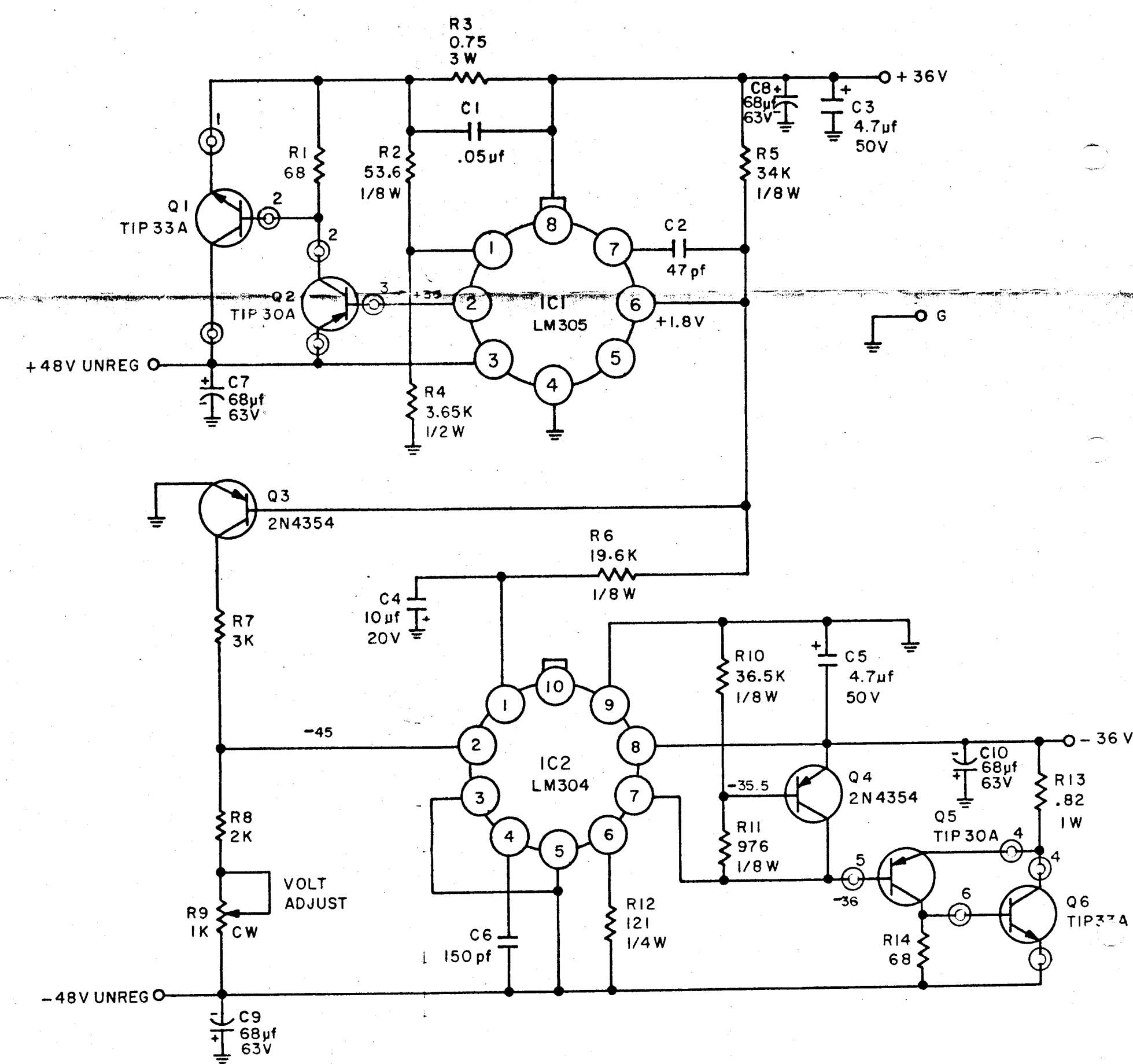
LEVEL SEL. SWITCHES IN enable

FROM GATE
Level Detector
CVS-12.5
3-11
Separated Video Levels



COMPUTER IMAGE CORPORATION		2475 W. 2nd. AVE. DENVER, COLORADO 80223.	
SCALE NONE	REVISION	REV A	BY B.A.
DATE 2-24-71			DATE 4/1/74
DR'W. E.R.	CR'D. JL		
AP'VD.			
TITLE GRAY LEVEL SWITCHES		No	

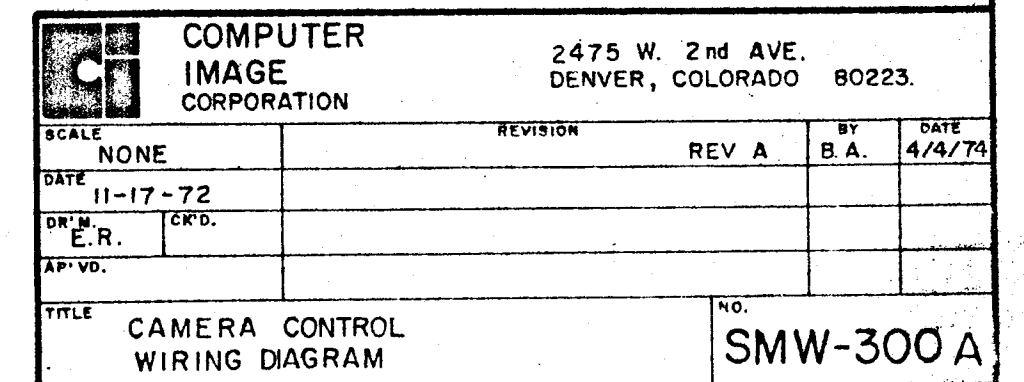
Gray Level Switches CVS-111

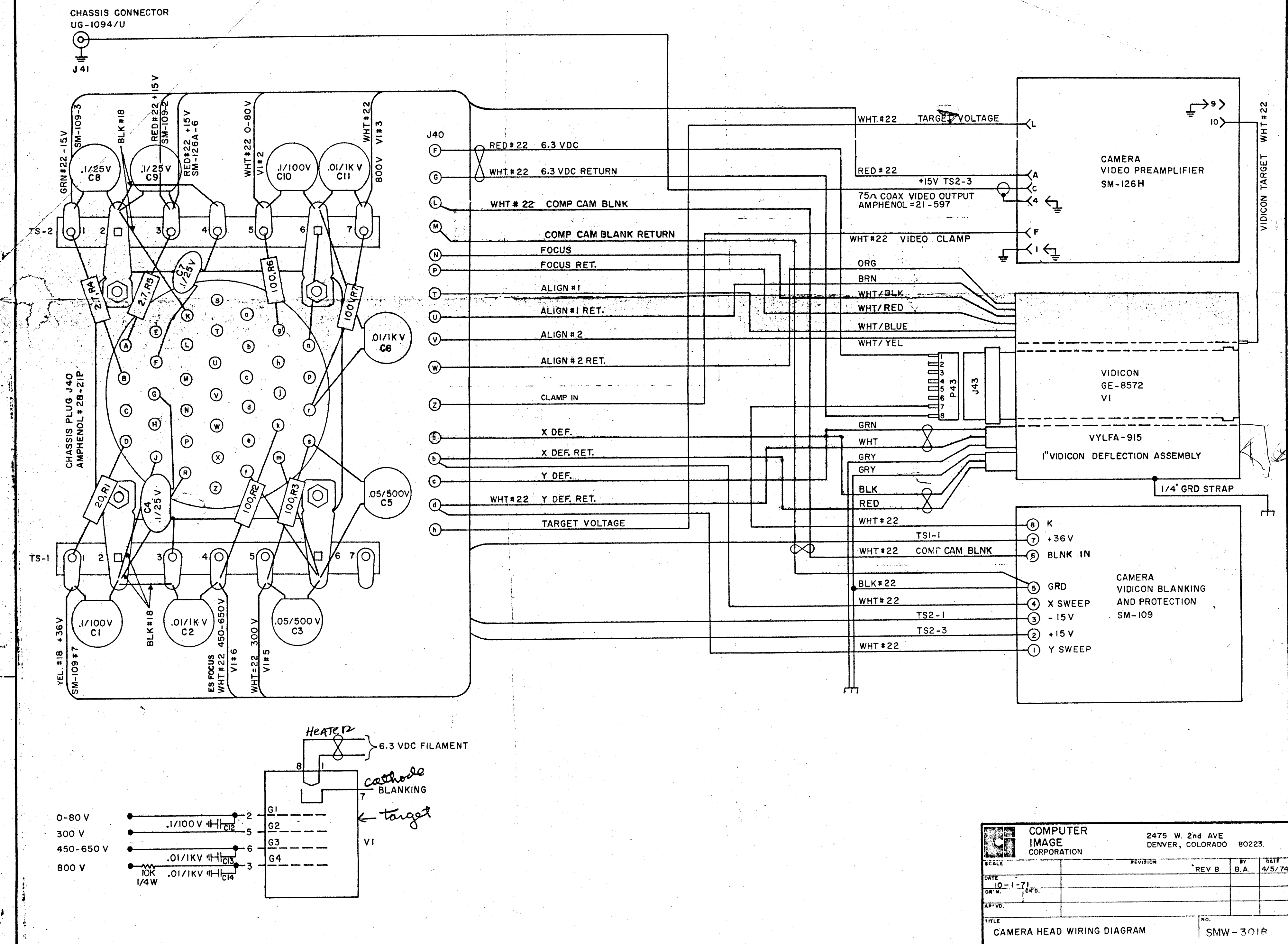


+ AND - inputs must
be present

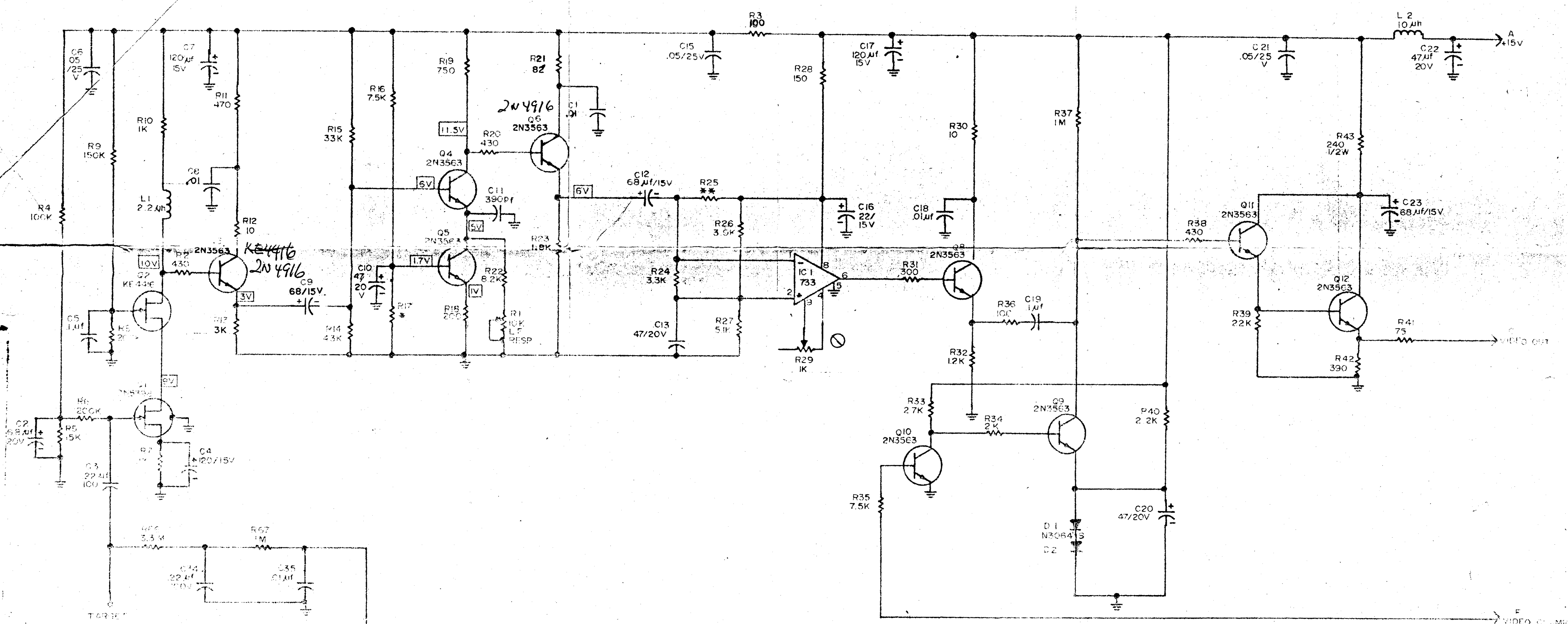
NOTE: Q1, Q2, Q5, Q6 MOUNTED ON DELTA NC-421K HEAT SINK.

COMPUTER IMAGE CORPORATION		2162 SOUTH JASON STREET, DENVER, COLORADO 80223.	
SCALE	REV. 510N	REV	BY R. K. P.
DATE			DATE 7-6-73
DR'W.	CK'D.		
APP'VD.			
TITLE ± 36 VOLT REGULATOR		NO. SM-111A	





COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE DENVER, COLORADO 80223.	
SCALE	REVISION	REV B	BY
DATE	10-1-71	CKD.	DATE
DR. W.			
AP. VD.			
TITLE CAMERA HEAD WIRING DIAGRAM		NO. SMW-3018	



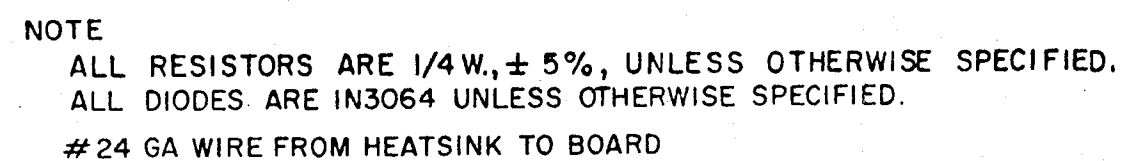
NOTE:
 ALL RESISTORS ARE 1/4W 5% UNLESS OTHERWISE SPECIFIED.
 1. 5% TOL. 50V DC AT 20°C (REF. 25°C).
 2. 5% TOL. FOR CAPACITORS UNLESS OTHERWISE SPECIFIED (APPROX. 75°C).

3, 6, 8, 10

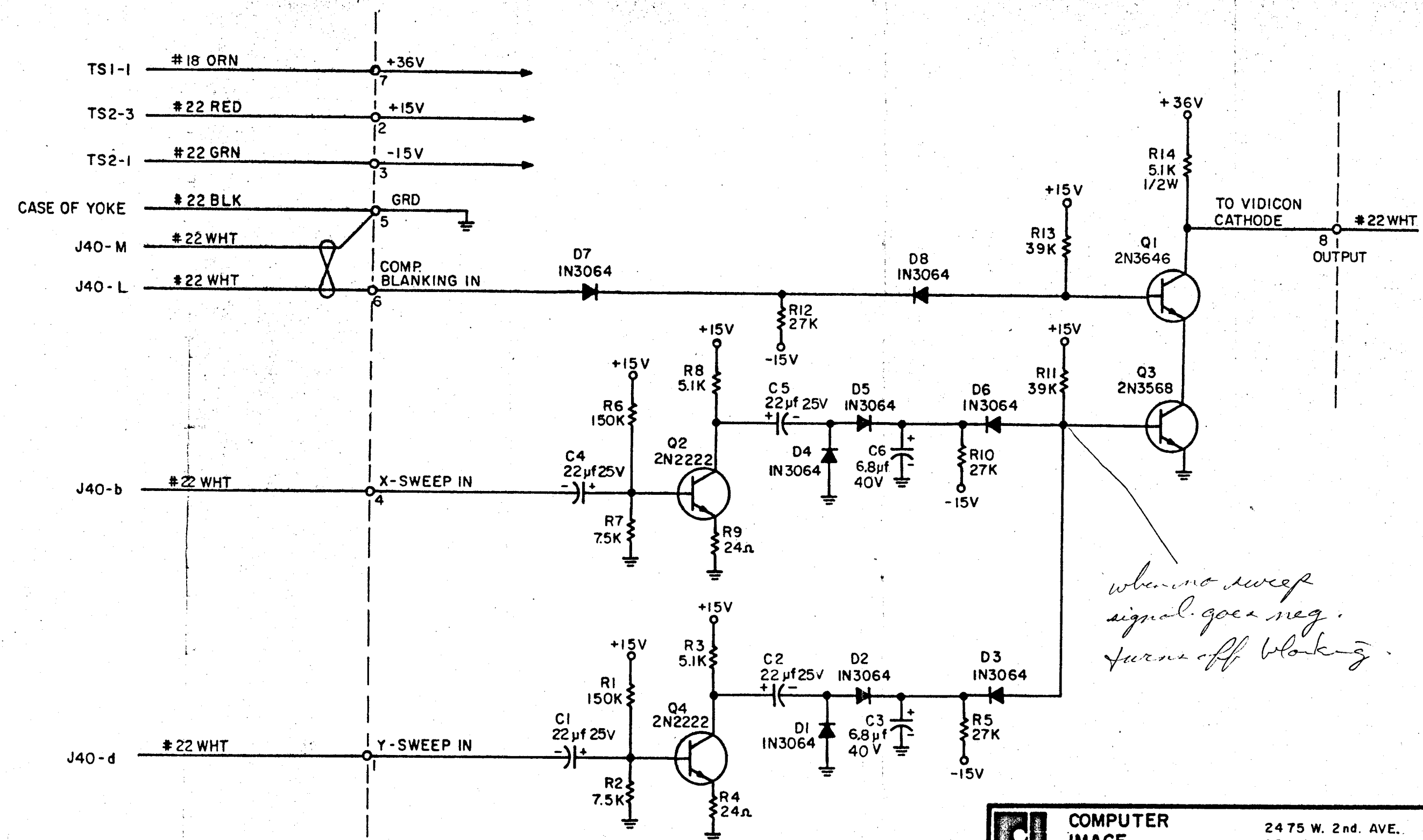
COMPUTER IMAGE

VIDEO PRE-AMP

SM-100K

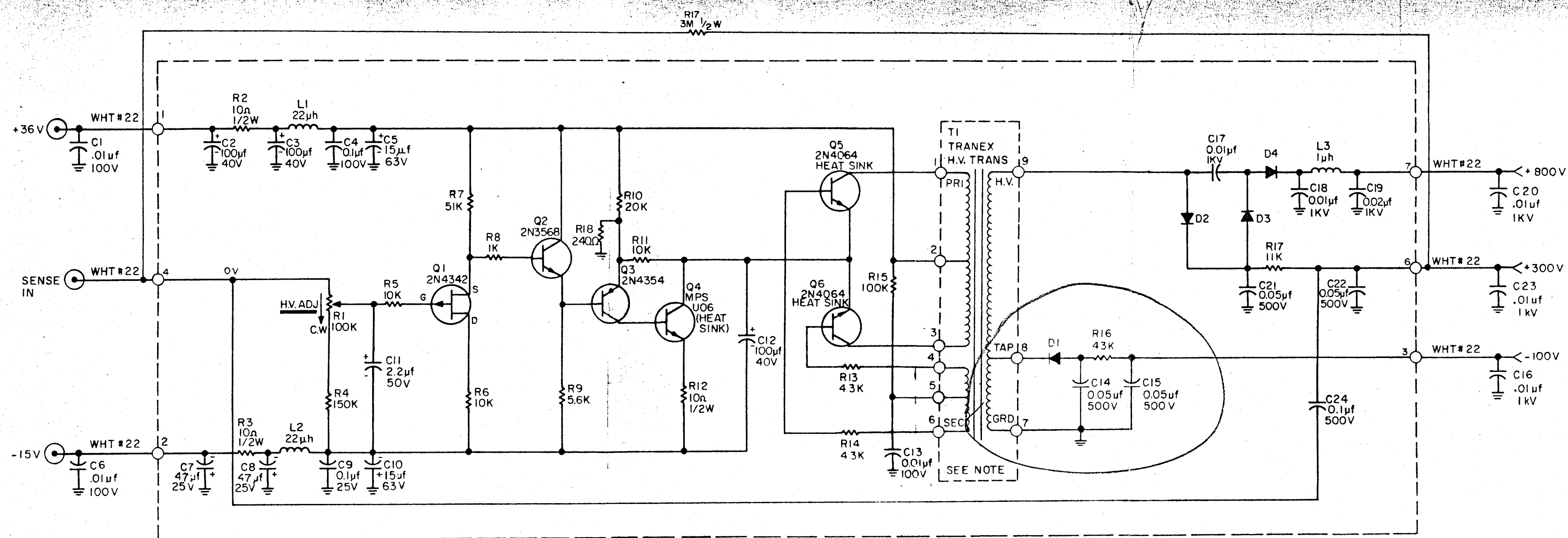


	COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223.	
SCALE NONE		REVISION D		BY B.A.
DATE 3-31-70		REVISION E		DATE 1-6-72
DR.'N. E.R.	CR'D.			R.K.P. 7-6-73
AP'VD.				
TITLE CAMERA YOKE DRIVER				NO. SM-117 E



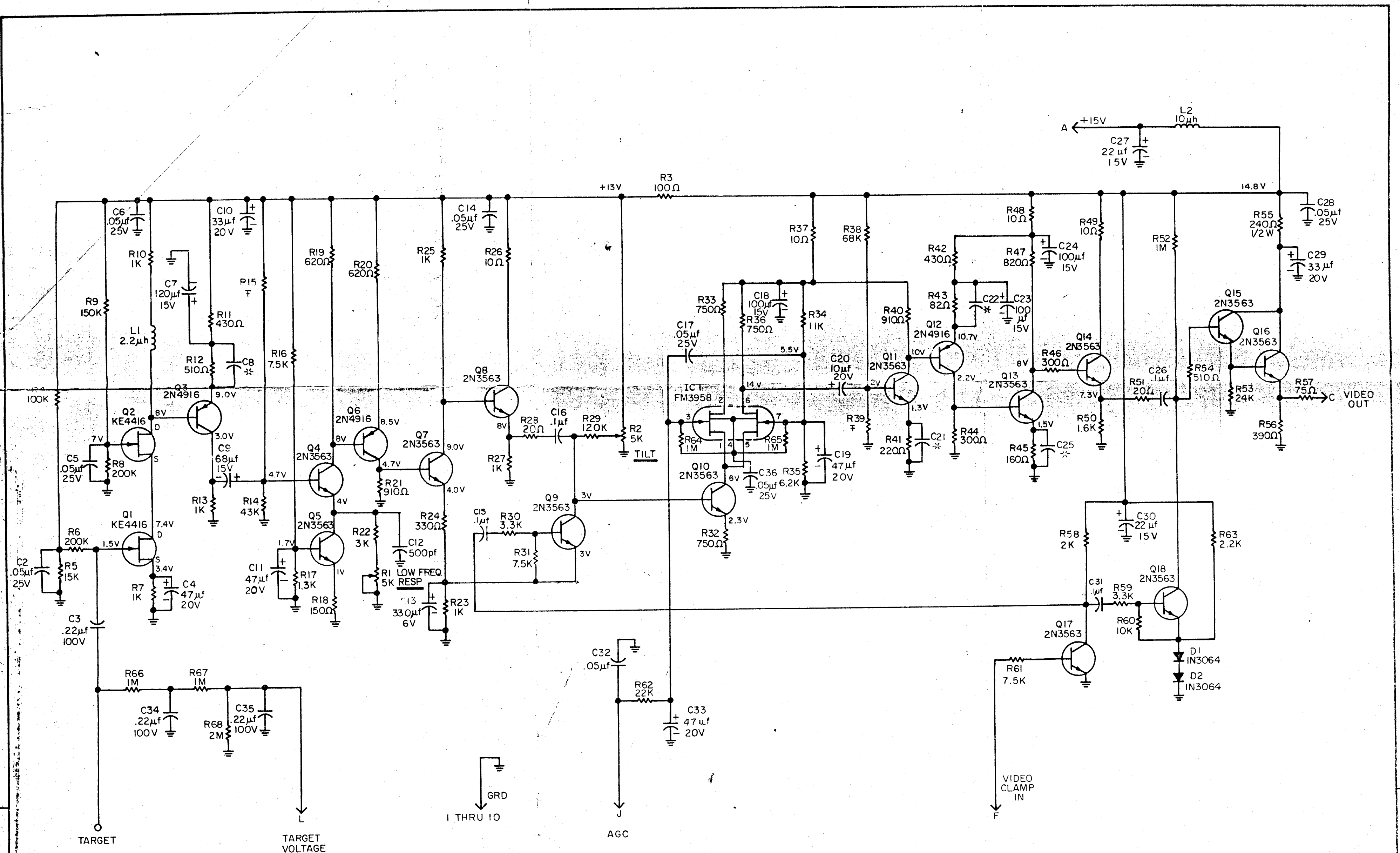
NOTE
ALL RESISTORS 1/4W UNLESS OTHERWISE SPECIFIED.

CI COMPUTER IMAGE CORPORATION		2475 W. 2nd. AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REVISION	
DATE	2-2-70	BY	
DR'N	E.R.	CK'D	
AP'VD			
TITLE		NO.	
CAMERA BLANKING & PROTECTION		SM-109	

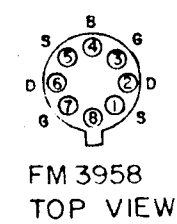


NOTE:
 ALL DIODES ARE SFM 30, SEMTECH, UNLESS OTHERWISE SPECIFIED.
 ALL RESISTORS 1/4W ±5%, UNLESS OTHERWISE SPECIFIED.
 ALL TRANSFORMER LEADS # 24 WHITE.

COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223.	
SCALE NONE	REVISION Rev	BY R.H.C.	DATE 12-2-70
DATE 2-2-70			
DR. M. E.R.	CK'D.		
TITLE CAMERA HIGH VOLTAGE POWER SUPPLY		NO. SM-121A	



NOTE:
 * SELECTED VALUE.
 † SELECT FOR 1.5 V AT
 EMITTER OF Q13
 SELECT FOR 8.0 V AT
 EMITTER OF Q8.



COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223	
DATE 5-16-71	REVISION H	BY D.M.	DATE 5-16-71
TITLE VIDEO PRE-AMP		NO. SM-126H	

Animation Crosspoint Switch	SMW-103	
Animation Controller Block Diagram	AM-B-100A	1
Animation Controller Wiring Diagram	AMW-100C	
Animation Controller Patch Panel	AMW-101	
Animation Controller Front Panel Wiring Diagram	AMW-102A	
Digital Switch Wiring Diagram	AMW-103A	
Patch Panel Wiring Diagram	AMW-104A	
Band Pass Filter 300 HZ	AM-100-1	
Band Pass Filter 2400/1200 HZ	AM-100-2	2
Band Pass Filter 810/530 HZ	AM-100-3	
Summing Amplifiers	AM-101-C	
High Frequency Oscillation	AM-102D	
Switch Driver	AM-103A	
Sequence Ramp Generator	AM-104B	
Sequence Ramp Timing Generator	AM-105C	
Sequence Intensity Generator	AM-106C	
Multiplier Card	AM-107	
Audio Pre Amplifier	AM-108A	
Full Wave Rectifier	AM-109A	
Audio Limiter	AM-110	
Low Frequency Oscillation	AM-111	
Cosine Generator	AM-112A	
Program Phase Lock	AM-113A	
Blanking Controller Wiring Diagram	RSBW-100-1	
BLANKING Block Diagram	RSB-B-100	
Horiz Line Counter and Thumbwheel Switch	RSB-B-101	
Blanking Patch Panel		
Blanking Sequence Timing Gen	RSB-100A	
Blanking Interval	RSB-101A-1	
Blanking Interval		
Summing Amplifier	RSB-102	
Voltage Comparator	RSB-103A	
Digital Switch Wiring Diagram	AM103	3.
Colorizer Rack AC-DC Wiring Diagram		
SOLA 48V supply		4.
TEKTRONIX 140 NTSC Signal Gen Mod		
Color Matrix		5.

Colrizer Block Diagram	CVSW-B-100
Wiring Diagram	CVSW-101-3
Color Switches	CVS-101B
SYNC Timing	CVS-102
Level Detectors	VS-103A
Color Controls	CVS-106B
Video Gate Color	CVS-116-1
Background Key Delay	CVS-116-2
SYNC Lock	CVS-120
Background Level Select	CVS-121-1
3.58 Filter	CVS-122A
Level Adjust	CVS-123A
3.58 Filter Shorting Goard	CVS-124
Lamp Driver	CVS-126
Mix-EFF Amplifier	VS-103-1

OPERATING PROCEEDURE

ANIMATION AID

I. General Description

The Animation Aid contains functional circuitry that expands the scope of operation of the Scanimate system. The Animation Aid provides:

- A. Mouth control circuitry to provide synchronization of mouth movement with an audio input of either a sound track or direct microphone input.
- B. Circuitry to sequentially intensify from 2 to 5 sections, with control of the number of frames the section is intensified.
- C. Circuitry to sequentially or manually start from 1 to 5 ramp generators. Each ramp is individually adjustable both for rate and start time. A linear ramp or sine shape may be selected.
- D. Two high frequency oscillators are provided for "raster bending". The oscillators may be phase locked on a horizontal line basis. A plus or minus cosine or a plus or minus sine function is selectable. There are provisions for controlling amplitude by either a front panel control or an external function generator. Frequency is controlled by a front panel control.
- E. Three low frequency oscillators are provided for general animation effects. As in the high frequency oscillators,

the waveform may be phase locked in either a plus or minus cosine or plus or minus sine function. In addition, a slow reset mode is available to use the oscillator as another linear or sine shade ramp generator. Two low frequency oscillators may be locked together in a special mode to produce a sine-cosine of the same frequency. As with the high frequency oscillators, frequency and amplitude are controlled with front panel controls, or the amplitude may be controlled with external functions.

- F. A dual full-wave rectifier is provided for general use.
- G. A dual multiplier is provided for multiplying any function by another function.
- H. Six summing amplifiers with three inputs each are provided for summing any of the above mentioned functions.
- I. Five gain potentiometers are provided to attenuate any function desired.
- J. Five bias potentiometers are provided to offset any function between plus and minus 15 volts.
- K. A ten by ten patch panel is provided for programming purposes. The inputs and outputs of all functions are available at the patch panel, including the gain and bias potentiometers.

II. Operation

A. Mouth Control Circuitry

The mouth control circuitry controls the movement of lips provided by artwork. A series of filters, summing

amplifiers and a limiter amplifier provide a control voltage for the upper lip, lower lip, and mouth width. This control voltage is derived from an audio input provided by tape or other high level means or a low level microphone input. Because the control voltage is derived from the audio input, the lip movement is synchronized with the sound track.

B. Sequential Intensity Generator

The sequential intensity generator intensifies one section and blanks all others. From two to five section sequences may be controlled. The number of sections used is selected by a front panel rotary switch.

A two digit thumbwheel switch is used to select the number of frames that each section is intensified.

When the switch is in the "X1" position, the thumbwheel switch reads directly (1, 2, 3, 4, up to 99). When the switch is in the "X10" position, the thumbwheel switch reads in 10's (10, 20, 30, up to 990).

The sequence starts when the switch is thrown from stop to start and will continue to cycle until the switch is returned to stop. All controls effecting the sequential intensity function are grouped inside the heavy black outline marked "sequential intensity".

C. Sequential Ramp Generator

The "manual/auto" switch must be in the "auto" position initially. This resets the ramp generators. When the

switch is thrown to "manual", the generator starts ramping at a rate determined by the "rate" pot. Each ramp may be started manually and the rate set before the automatic sequence is started.

For automatic operation, all "manual/auto" switches must be in the "auto" position.

The "initial/final" switch on Scanimate starts ramp number one. Ramp number two starts automatically at a time, set by a three digit thumbwheel switch. The switch indicates the frame number after the "initial/final" switch is thrown, that ramp two will start. Ramp number three will start when the frame occurs that coincides with the number set on the thumbwheel switch marked "start 3". The same applies for the remaining sections. The ramps may be programmed to start in any order and the rates may be set independently.

The important things to remember are that the "man/auto" switches must be in "auto" for automatic operation. The number set in the thumbwheel switch is the frame number (after the "initial/final" switch is thrown) that starts the ramp. Ramp number one starts with the "initial/final" switch. Returning this switch to "final" resets the ramp generators and the frame counters.

A triangle or sine shape may be selected by placing the switch in the proper position.

A "X1/X2" switch is located on the sequence ramp timing

generator card, and enables the frame count to be doubled when in the "X2" position, or the frame count may be stopped when in the center off position.

All controls that effect the ramp generator function are located inside the black outline marked "ramp control" except the "X1/X2" switch on the PC board.

D. High Frequency Oscillators

Oscillators number one and two are high frequency types.

(Approximately 90 KHz max.)

The frequency is adjusted by the frequency pot. The amplitude is adjusted by the amplitude pot, ($\pm 10\text{v}$ max. -0v min. or an external function.

These oscillators may be phase locked the same as the basic oscillators in Scanimate, only the high frequency oscillators are locked to a horizontal line instead of a vertical frame. This allows the whole raster to be shaped.

A triangle or sine shape may be selected by placing the switch in the proper position.

A "sine/cosine" switch is located on the PC board and enables the waveform to start at zero instead of plus or minus peaks, when in the phase lock mode. This switch is normally in the "cosine" mode.

All controls that effect the high frequency oscillators are located inside the black outline labeled "oscillator control" except the "sine/cosine" switch on the PC board.

E. Low Frequency Oscillators

Oscillators number 3, 4, and 5 are low frequency oscillators.

The frequency is adjusted by the frequency pot, the amplitude is adjusted by the amplitude pot or an external function.

These oscillators may be phase locked to either the frame or the sequence by placing the "frame/sequence" switch in the proper position. The waveform may be phase locked top or bottom by placing the "top/bottom" switch in the proper position.

Oscillators number 3 and 4 are wired for a cosine-sine relationship. Oscillator number 3 is the cosine reference and number 4 is the sine slave. When wired in this special mode, frequency pot number 4 is disabled and the frequency of number 4 will follow oscillator number 3.

The "sine/cosine" switch and the "fast/slow" switch on the PC board must be in the "cosine" and "fast" positions respectively when in the special cosine/sine reference/slave mode.

Oscillators number 3 and 5 may be used as normal low frequency oscillators.

The "sine/cosine" switch on the PC board is the same as the high frequency oscillator described above.

The "fast/slow" switch on the PC board disables the phase lock mode when in the "slow" position. When in this position, the oscillator will stop running and ramp to the plus or minus position. With the "frame/sequence" switch in the "frame" position, throwing the "top/bottom" switch to the opposite position will ramp the oscillator to the

other extreme position. It will remain there until the switch is again thrown to the opposite position. Thus the oscillator may be used as an additional ramp generator. A triangle or sine shape may be selected in all modes by placing the switch in the desired position.

All controls affecting the low frequency oscillators are located in the black outline labeled "oscillator controls" except the "sine/cosine" and "fast/slow" switches on the PC board.

F. Dual Full-wave Rectifier

A dual full-wave rectifier is provided for rectifying any of the functions generated by the Animation Aid or external functions. There are no external controls for this function.

G. Dual Multiplier

A dual analog multiplier is provided for multiplying one function by another or for use as a variable gain amplifier. There are no external controls for the multiplier.

H. Summing Amplifiers

Six unity gain, inverting summing amplifiers are provided for summing functions or inverting functions. There are no external controls for the summing amplifiers.

I. Gain Potentiometers

Five gain potentiometers are provided on the front panel for the purpose of attenuating functions. One side of the pot is connected to ground and the wiper and the

clock-wise side of the pot are connected to the patch panel and may be programmed as desired.

J. Bias Potentiometers

Five bias potentiometers are provided to obtain a variable DC voltage.

The clock-wise side of the pot is connected to +15 volts and the counter clock-wise side is connected to -15 volts. The wiper is connected to the patch panel and may be programmed as desired.

K. Patch Panel

A ten by ten patch panel is provided on the front panel to facilitate programming of the functions in the Animation Aid. The outputs of all generated functions of the Animation Aid are connected to the patch panel. The output circuitry is short circuit protected in case the output is accidentally shorted to ground. The inputs to all functions generated in the Animation Aid are connected to the patch panel. The inputs to the cherry switch on Scanimate are also connected to the patch panel on the Animation Aid. Therefore, any function generated by the Animation Aid may be connected to Scanimate and utilized to the fullest by the ingenuity and imagination of the operator.

I. MOUTH CONTROL CIRCUITS

The mouth circuit uses the 2 high frequency oscillators for bending the raster to make the mouth move. The connections on the patch board to program in the mouth circuit are as follows:

Upper lip (H3) to oscillator 1 multiplier (A1)

Lower lip (H4) to oscillator 2 multiplier (A2)

Oscillator 1 output (B1) to cherry switch 2 (B9)

Oscillator 2 output (B2) to cherry switch 3 (C9)

Mouth width (H5) to cherry switch 4 (D9)

Divide the artwork into two sections with the upper lip on section 1 and the lower lip on section 2. Proper positioning of the artwork will follow after the oscillators are set up. On the cherry switch set final vertical section 1 to bus 2, final vertical section 2 to bus 3, size width section 1 and 2 to bus 4. Turn pots 2, 3, and 4 on cherry switch fully clockwise.

Oscillator 1 and 2 should be set to "cos" position. This switch is on the oscillator PC board and is labeled. On the front panel set oscillator 1 to "bottom" and "sinwave" positions and on oscillator 2 set to "top" and "sinwave" positions. The amplitude pots on both oscillators should be fully counter clockwise. Adjust the frequency of both oscillators so that there is a little less than one cycle of bending. To see the bending turn the "offset" on the upper and lower lip controls. The artwork must now be positioned so that when the raster is bent the zero crossings of the bend is at the ends of the lips. If the position is not exact the corners of the lips will either part or cross when the mouth is animated.

II. SEQUENCE INTENSITY GENERATOR

This circuit is used to intensify sequentially 2, 3, 4, or 5 sections. In the following example we will use five sections.

On Scanimate divide the raster into five sections.

Connect sequence intensity outputs (C1), (C2), (C3), (C4) and (C5) to (B9), (C9), (D9), (E9) and (F9) respectively. Turn the gain pots 2, 3, 4, 5, 6 on cherry switch fully clockwise.

Set all five sections of green comm to zero. On cherry switch set

green section 1 to bus 2

green section 2 to bus 3

green section 3 to bus 4

green section 4 to bus 5

green section 5 to bus 6

In the block marked "sequence intensity" on the animation aid set thumbwheel switch marked frames for the number of frames that each section is intensified. In our example use 47 frames. Set rotary switch to 5 and the X10/X1 switch to X1. Set the start/stop switch to stop then to start. On the display the first section should intensify for 2 seconds and switch to second section and intensify it for two. This will continue for each section and then repeat the sequence after intensifying the fifth section. If only 2 sections are used set rotary switch to 2.

The voltages from this sequence intensity generator can also be used for moving a section instantly from one location to another and back. For example if you had section one in the lower left corner of the frame and wanted to move image to the top right part of frame and back once a second. Set frame count to 23 (the 24th

count is used to reset the counter). Set X1/X10 switch to X1.

Connect a three wire jumper from (C1) to (B9), and C9. On cherry switch set final horiz section 1 to bus 2 and final vertical section 1 to bus 3. Set both pot 2 and 3 fully counter clockwise. Set start/stop switch to stop and then to start. On cherry switch turn clockwise pot 2 and 3 until the desired movement is achieved. As pots 2 and 3 are turned clockwise this will change the final position so final position pot will have to be adjusted at the same time. The movement from lower left to upper right and back to lower left will continue until the start/stop switch is switched to the stop position. If these signals are connected to the initial horiz and vertical on the cherry switch instead of the final horiz and vertical, the back and forth movement can be multiplied out in final position.

III. SEQUENTIAL RAMP GENERATOR

These five ramps can be used many ways so I will describe several different types of operations.

A. Sequence Ramp

When used as sequence ramps they must be programed different for different operations.

1. Initial/final operation

Divide the raster into two sections on Scanimate. Set function switch to commutator position and monitor the sequence commutator on scope. Set sections 1 and 2 for about +5 volts. This will get you close to final position when sequence ramps are in final position. On the Z channel PC board (J6) in Scanimate, switch the toggle switch on top of the board to sequence position.

This disables the sequence ramp in Scanimate.

The outputs of the sequence ramps on the Animation Aid are (D1), (D2), (D3), (D4) and (D5) on the patch board.

For this example we will use only ramps 1 and 2. Connect (D1) to (B9) and (D2) to (C9). On cherry switch turn pots 2 and 3 fully clockwise. Set sequence section 1 to bus 2 and sequence section 2 to bus 3.

Set function switch to "sequence control" and set zero volts on both sections with sequence commutator pots when the initial/final switch is in final.

Set "initial/final" switch on Scanimate to initial.

To check the rate of ramp 1, switch the "manual/auto" switch to "manual" and ramp 1 will ramp to final position at a speed set by rate 1 pot. Switch back to "auto" and ramp 1 will reset. Switch back and forth changing rate pot until desired rate is achieved. Do the same for ramp 2 adjusting rate 2 pot.

Ramp 1 will start to ramp from initial when the "initial/final" switch is changed from "initial" to "final". At this same time a frame counter is started to count the number of frames. This frame count is used to start the other four ramps. The thumbwheel switch labeled start 2 controls the start time of the second ramp. The number on the thumbwheel switch is the number frames after the "initial/final" switch is switched to final. The control of all five sections with the sequence ramps are set up the same as the two sections described above.

On the sequence ramp timing generator P.C. board J8 there is a 3 position switch. The back position is the normal position for the frame counter. The center position is the "off"

position and the frame counter is stopped. The forward position is a X2 position which will double the count on the thumbwheel switches. This will extend from about 40 seconds to over 80 seconds of control on the ramps. The off position allows the operator to operate each ramp independently. This is especially good for setting up an animation.

2. Initial-final-initial operation

This operation would be similar to the A-B switch on Scanimate. In the sequence mode this operation will require 2 ramps per section and 2 summing amplifiers of the animation aid. The example I will describe will be a start at initial ramp to final hold 2 seconds and then ramp back to initial. Connect ramp 1 (D1) to the input of summing amplifier 1 (A6). Connect the output of summing amplifier 1 (D6) to input of summing amplifier 3 (A7). Connect ramp 2 (D2) to the input of summing amplifier 3 (B7). Connect the output of summing amplifier 2 (D7) to cherry switch input (B9).

Set Scanimate for one section and function sector to commutator position. Adjust sequence comm section 1 for zero volts. On cherry switch set sequence section 1 to bus 2 and turn pot 2 fully clockwise. On animation aid set switch on sequence ramp timing generator-P.C. board (J8) to the middle off position. On ramp 1 set "manual/auto" switch to manual and on ramp 2 set "manual/auto" switch to manual then back to auto position. Change function selector switch to sequence control position and set for zero volts with sequence commutator section 1 control. Set rate 1 for about 1 second ramp on ramp 1 and then do the same for ramp 2.

Set thumbwheel switch "start 2" to 096. On sequence ramp timing generator P.C. board set switch to back position. On Scanimate set initial/final switch to initial and then to final. The image should move from the initial position to final in one second, hold for 3 seconds then move back to initial position in one second.

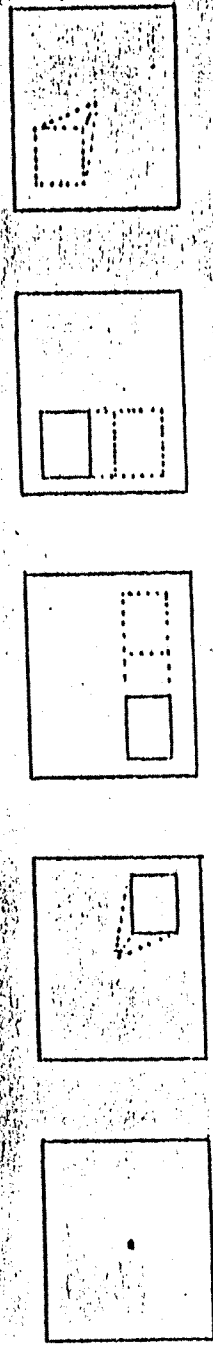
B. Single Movement of Image

The sequence ramps can be used for moving images around on the screen in either final or initial positions. The basic program is as follows: Connect D1 to B9 and on cherry switch set final horiz to bus 2 and adjust pot 2 for the proper movement on the screen. In this set up the ramp will move the image on the screen from left to right. Set final horiz on cherry switch back to Gnd and set final vertical to bus 2 and adjust pot 2 for the proper movement on the screen. When the "manual/auto" switch on ramp 1 is switched to "manual" the image will move from the bottom of screen to the top of screen. Switch the "manual/auto" switch back to auto and the image will move back to bottom of screen very fast. On cherry switch set the final vert back to Gnd and set final depth to bus 2 and adjust pot 2 for proper movement on the screen. In the auto position the image will be small and in the manual position the image will be large. If on any of the movements you would want the opposite direction the ramp output must be inverted by going through a summing amplifier. The connection for that set up could be as follows: Connect ramp 1 output (D1) to summing amplifier 1 input (A6). Connect the output of summing amp 1 (D6) to cherry switch input (B9). On cherry switch set final depth to bus 2 and adjust pot 2 for proper movement. Now when ramp 1 "manual/auto" switch is switched to

manual the image will start big and get smaller.

C. Multiple movement of image

An example to show several different movements to one image combining animation aid and scanimate. Use one section and set up Scanimate for a zoom from a point to an image less than half screen in size at final. Set final position for lower right screen. Set initial dot in center of screen. Start by programing



ramp 2 to move the image to the left. Use ramp 2 instead of ramp because ramp 1 always starts with the initial/final switch set to final and the first movement of the image is to the left after reaching final position. Ramp 2 must be inverted to move the image left. Connect ramp 2 (D2) to summing amplifier 1 input (A6) and summing amplifier 1 output (D6) to cherry switch input (B9). On cherry switch set final horizontal section 1 to bus 2 and start turning pot 2 clockwise until the horizontal movement is right when ramp 2 manual/auto switch is switched back and forth. Final horizontal pot on Scanimate has to be changed each time pot 2 on cherry switch is changed because it affects the final position. Next program ramp 3 to move image up in the frame. Connect ramp 3 (D3) to cherry switch input 3 (C9) and on cherry switch set final vertical section 1 to bus 3 and adjust pot 3 until the vertical movement is right when the ramp 3 manual/auto switch is switched

back and forth. The final vertical pot on Scanimate has to be changed each time pot 3 on cherry switch is changed because it effects the final position. Last program ramp 4 to move the image back to a dot using depth. Connect ramp 4 to move the image back to a dot using depth. Connect ramp 4 (D4) to summing amplifier 3 input (A7). Connect summing amplifier 3 output (D7) to cherry switch input 4 (D9) and on cherry switch set final depth section 1 to bus 4 and adjust pot 4 for movement back to a dot as ramp 4 manual/auto switch is switched back and forth. As in the other two movements final depth on Scanimate has to be changed as pot 4 is changed.

To get the image to go to a dot in the center with depth the axis controls can be adjusted. This also changes the final position. With this adjusted go to initial position on the initial/final switch and adjust the initial position of the dot. Set the switch on the sequence ramp timing generator P.C. board (J8) to center "off" position. Set initial/final switch on Scanimate to final. Now each ramp can be adjusted for the right time by switching "manual/auto" switch back and forth on each ramp if this was not done on the initial set up. Also set thumbwheel switches for the proper start times. For this example set each ramp for 1 second and a hold time for each position of 2 seconds. The start for ramp 2 would be 072 on thumbwheel switch, start 3 would be 144, start 4 would be 216. Set initial/final to initial and the switch on the sequence ramp timing generator (J8) to the back position. Now when the initial/final switch is switched to final the image start at a dot in center and zoom to lower right and hold for 2 seconds. Then it will move horizontally to the left and hold for

2 seconds. Next it will move to the top of frame and hold for 2 seconds. Last it will zoom back to a dot.

One ramp can be added to two places to get angle movement. If the same ramp was connected to horizontal and vertical the movement would be at 45 degrees.

IV. HIGH FREQUENCY OSCILLATORS

There are two high frequency oscillators which can be used to bend or shape the raster. The outputs of them are (B1) and (B2). For the most effect use them on the initial or final vertical of the cherry switch. Both of these oscillators have a multiplier control on the input so that the amplitude of the output can be controlled electronically.

Operating Procedure Blanking Controller

The "Blanking Controller" is used with Scanimate to blank or unblank, wipe on or off selective portions of the raster. It contains a vertical segment control portion and a horizontal segment control portion. It also contains several summing amps, voltage comparators, digital inverters, offset controls, gain controls and a large patch panel for access to various inputs, outputs and functions.

The "Vertical segment control" has 4 sets of thumbwheel switches each with three digits. The vertical segment is set up the same as the section control in Scanimate. The horizontal line number is dialed up on the switch that will start each segment.

The "Horizontal segment control" consists of several (20) variable one-shots each controlled by a front panel pot. The Horizontal segment control portion of the front panel is set up the way the raster is scanned. The first pot of each vertical segment starts at the left hand edge of the raster and moves to the right. The minimum width is less than the horizontal blanking pulse. The maximum width is longer than a horizontal line. If the first horizontal segment is set shorter than a horizontal line, segment 2 will start when segment 1 ends. The same thing happens when segment 2 ends etc.

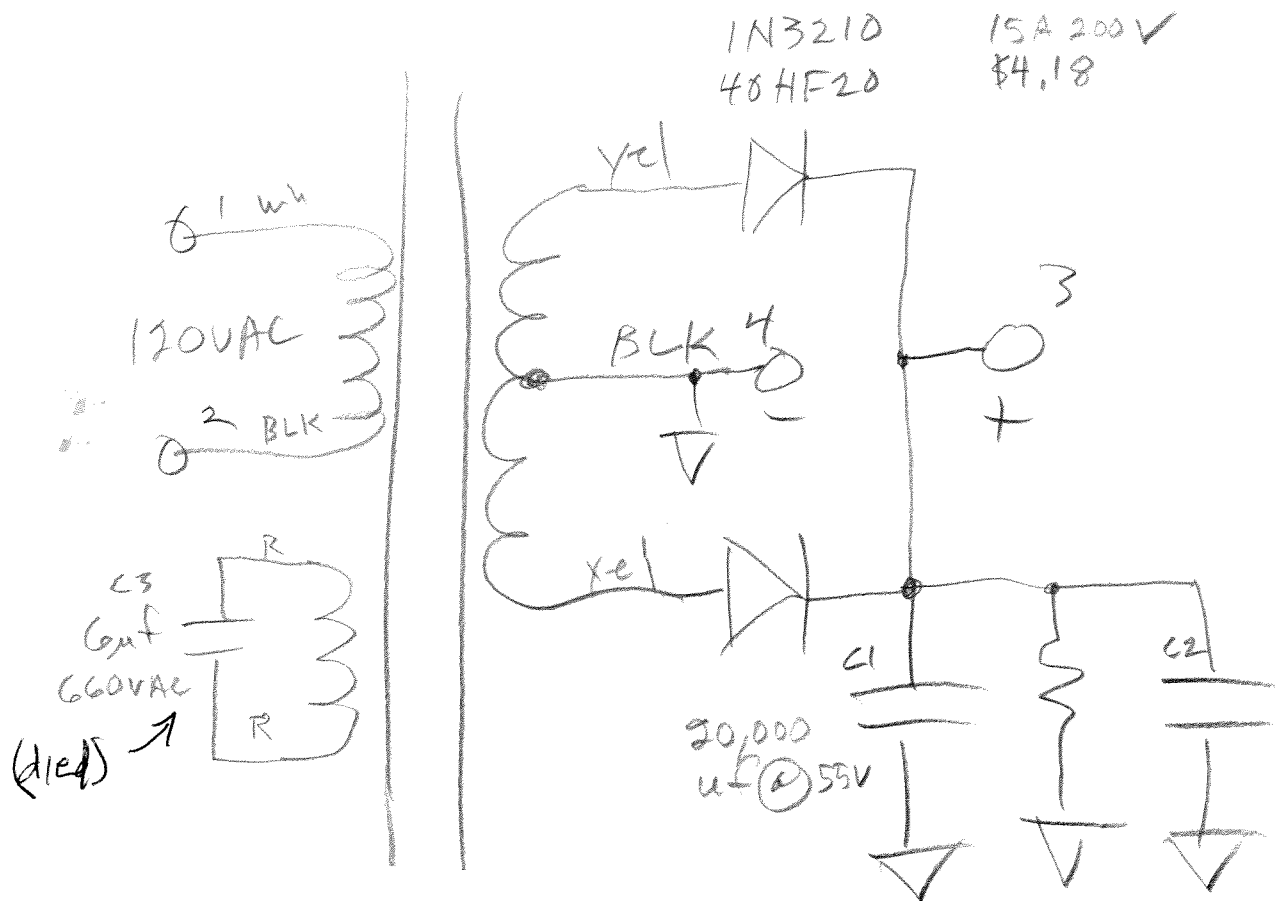
The "Inhibit/external/enable" switch determines if the segment is blanked or unblanked. When in the "enable" position, the raster segment is blanking. When in the "inhib/ext" position, the blanking function is inhibited. This position also

enables the external inputs for use with the sequential blanking pulse from the "animation controller" or the wiping function set up. Each switch is associated with the horizontal segment control to the left.

The "patch panel" contains the 5 sequence ramp outputs, the 5 sequential intensity pulses, the horizontal and vertical ramp generator outputs from the animation controller, the inputs and outputs of the summing amps, voltage comparators and digital inverters. Access to the offset controls and gain controls is also obtained through the patch panel.

The summing amps may be used to sum the horizontal and vertical ramps with a sequence ramp in various combinations. The composite summed function is then patched into the voltage comparators. The comparator's digital output may be used directly or patched to the digital inverters. The output is then patched into the external inputs corresponding to the desired raster segment.

The sequential intensity pulses from the animation controller may also be patched to various external inputs to sequentially blank segments of the raster.

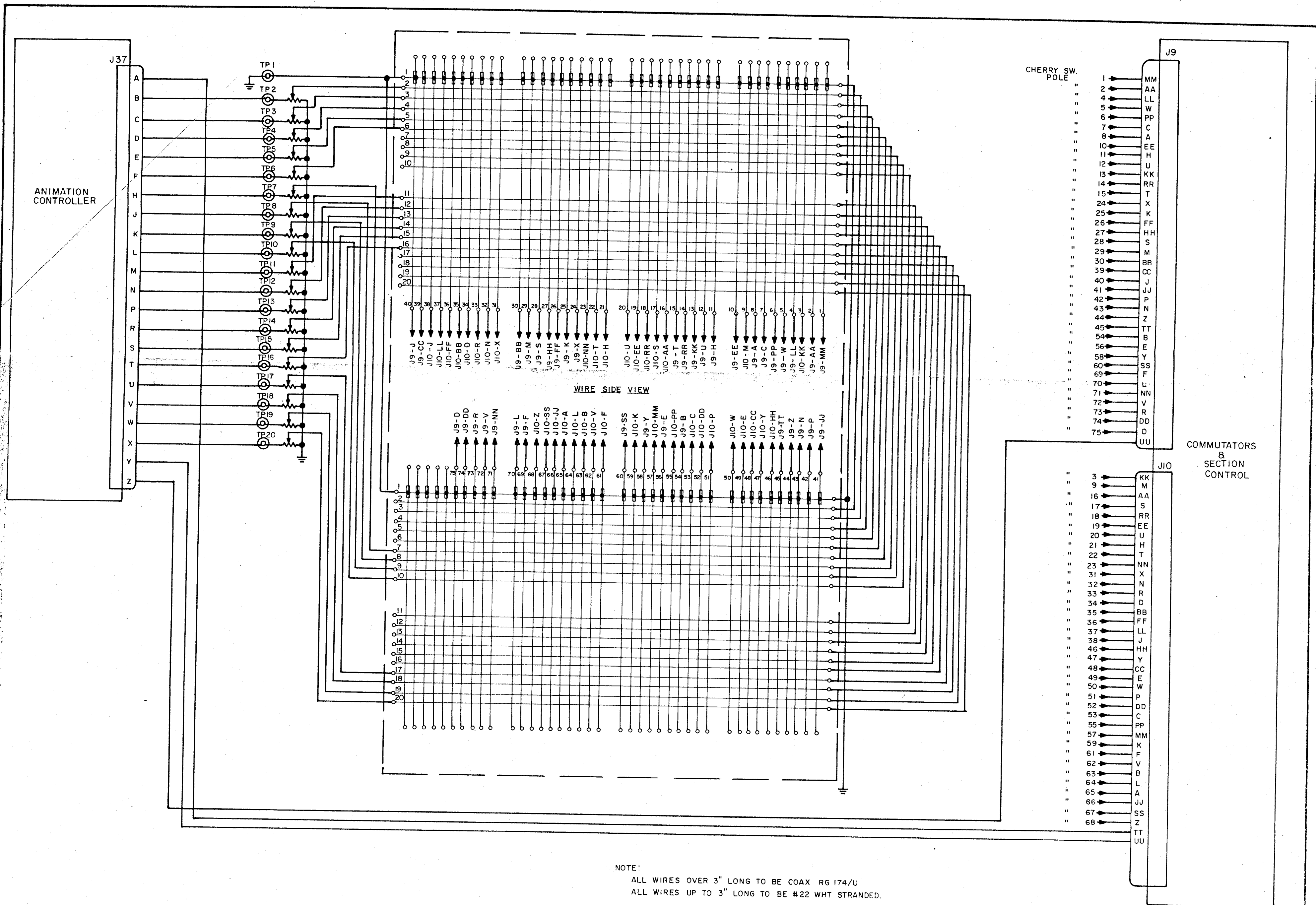


C1, C2 = Cornell-Dubilier
DCMC223M063CC2F

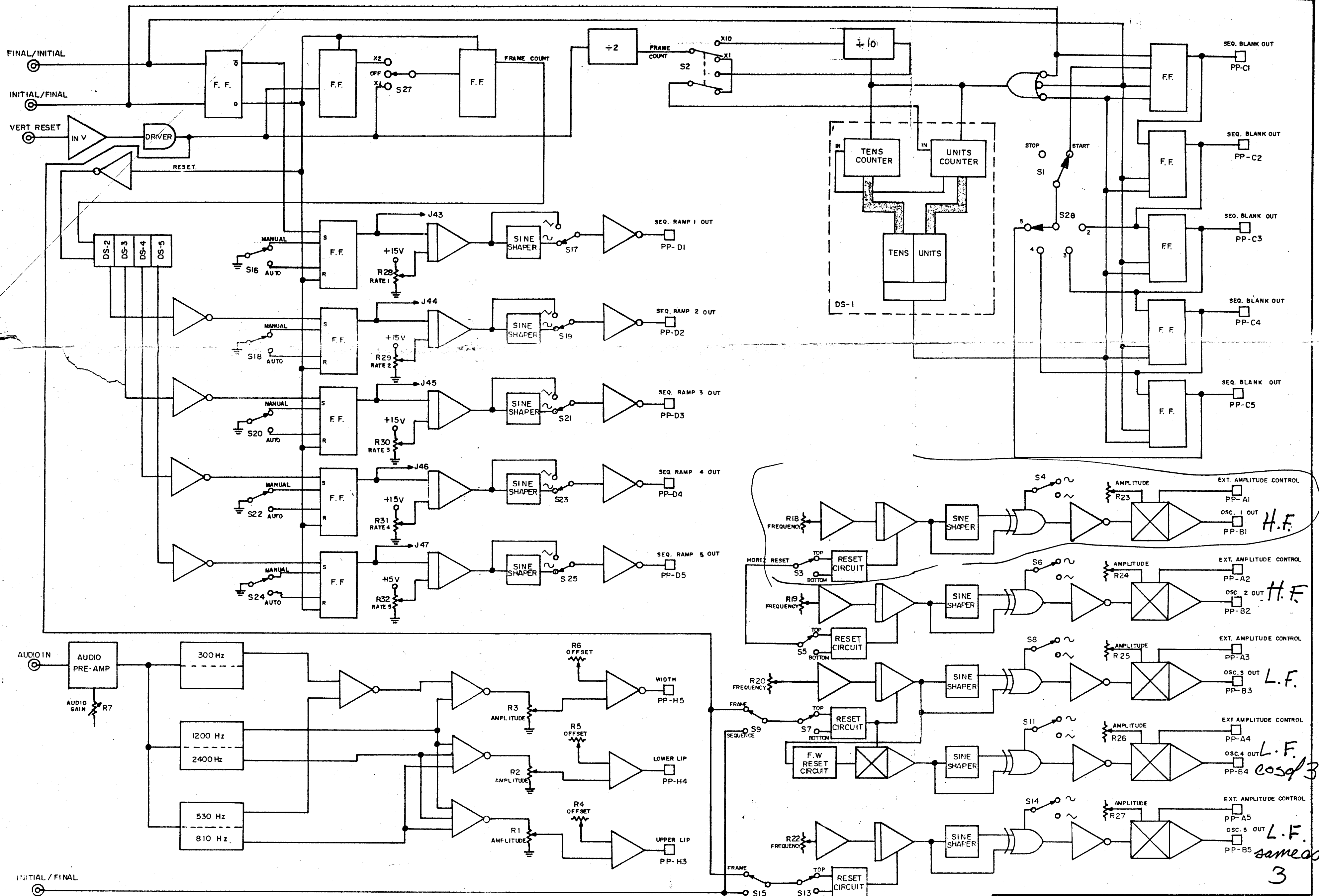
SOLA
48V Supply

3-24-2014
DMS

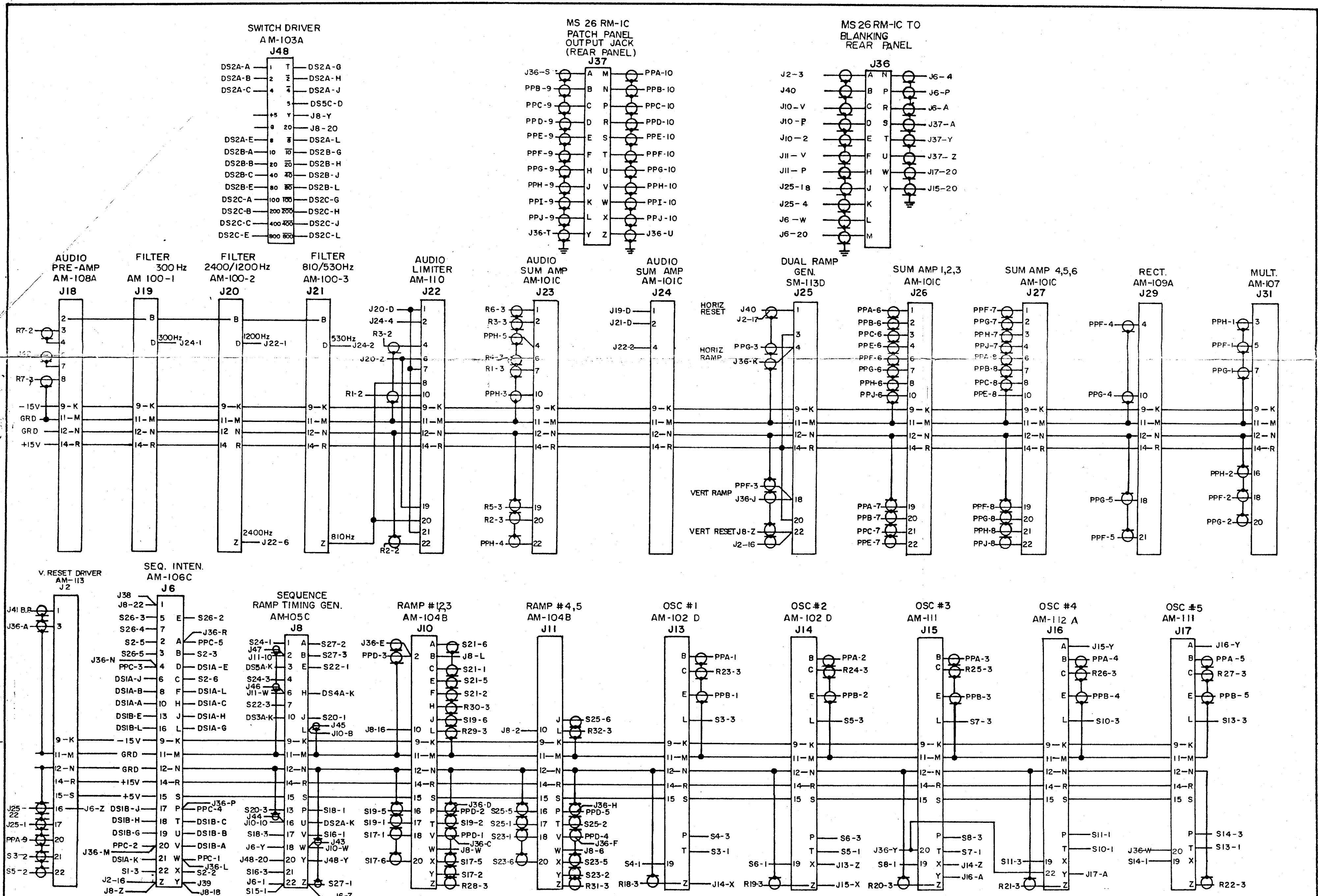
Defn = 10A
Cams = 4A



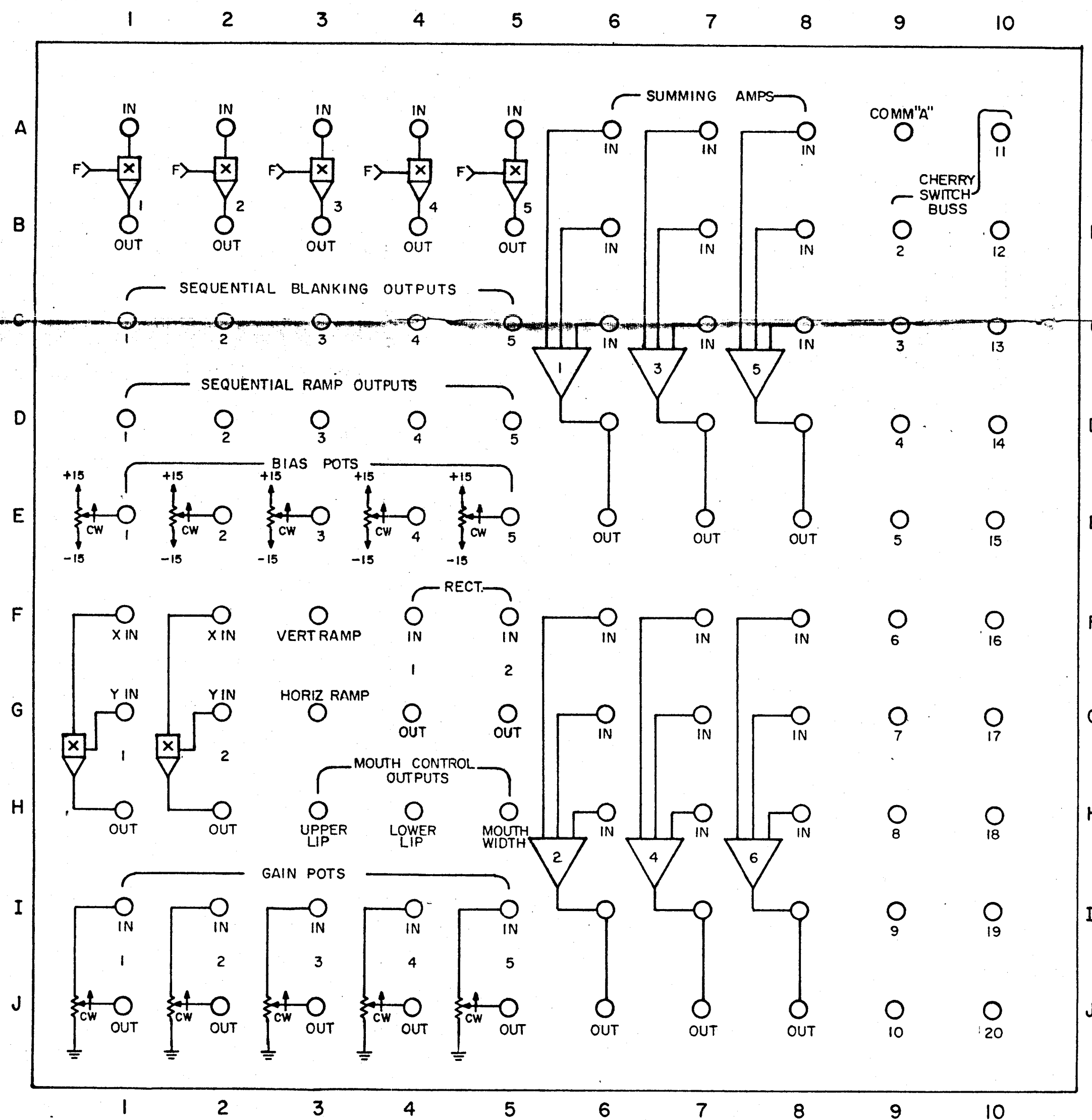
 COMPUTER IMAGE CORPORATION		2475 W. 2nd. AVE DENVER, COLORADO 80223	
SCALE	NONE	REVISION	BY
DATE	12-30-71	DATE	
DRW	E.R.	CHKD	
APRVD			
TITLE		NO.	
ANIMATION CROSSPOINT SWITCH		SMW-103	



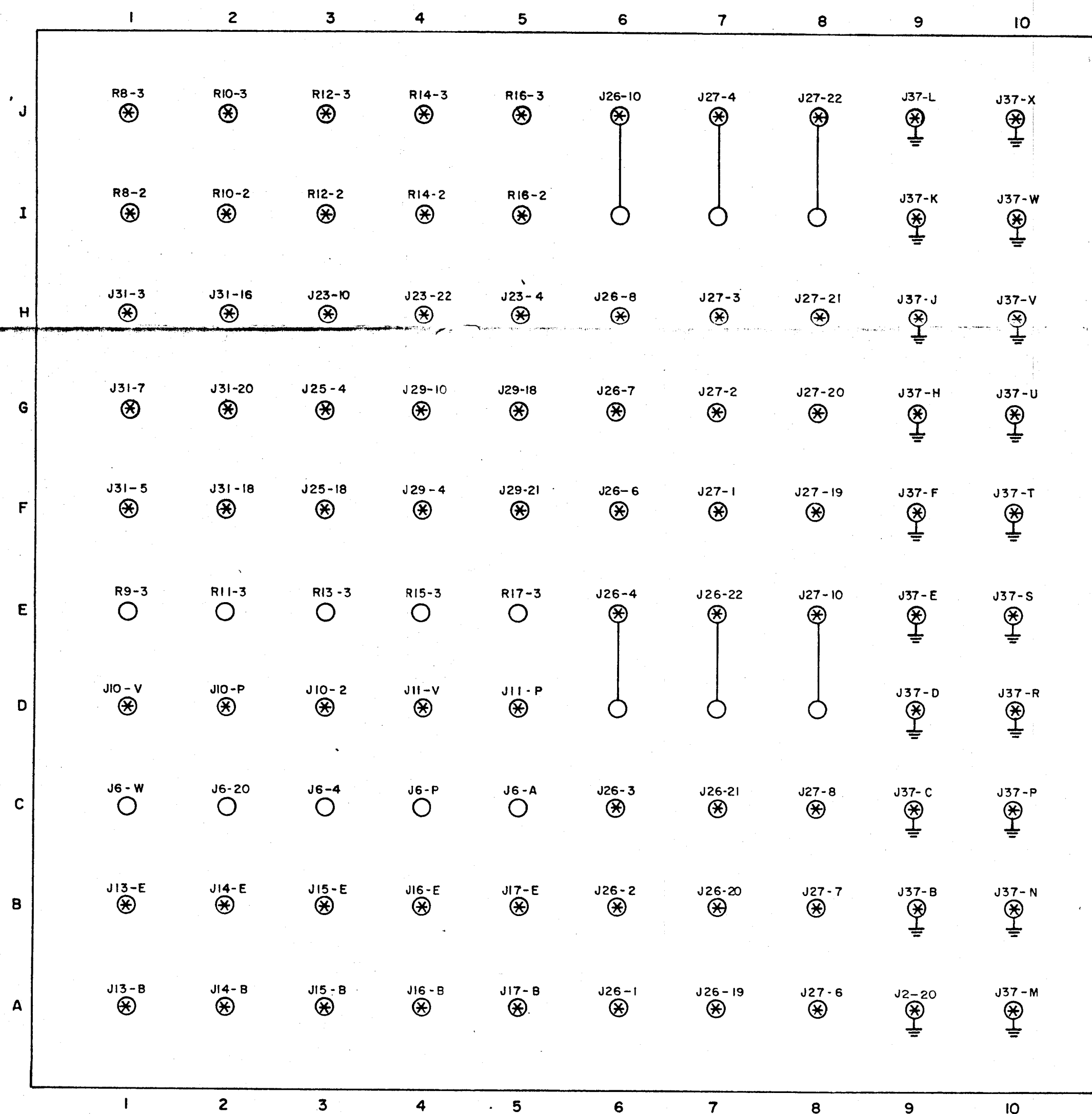
 COMPUTER IMAGE CORPORATION		2475 W. 2nd. AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REV	REV-A
DATE	11-24-72	BY	R. K. P.
DR'N	E. R.	DATE	8/6/73
AP'VD			
TITLE		NO.	
ANIMATION CONTROLLER BLOCK DIAGRAM		AM-B-100A	



COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE DENVER, COLORADO 80223.	
SCALE NONE	REVISION	BY R.K.P.	DATE 8/8/73
DATE 9-9-71		DR. W. E.R.	CK'D. 7-9-73
TITLE ANIMATION CONTROLLER WIRING DIAG.		REV. R.K.P.	
		NO. AMW-100C	

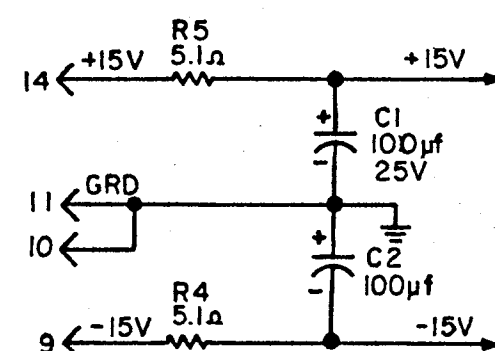
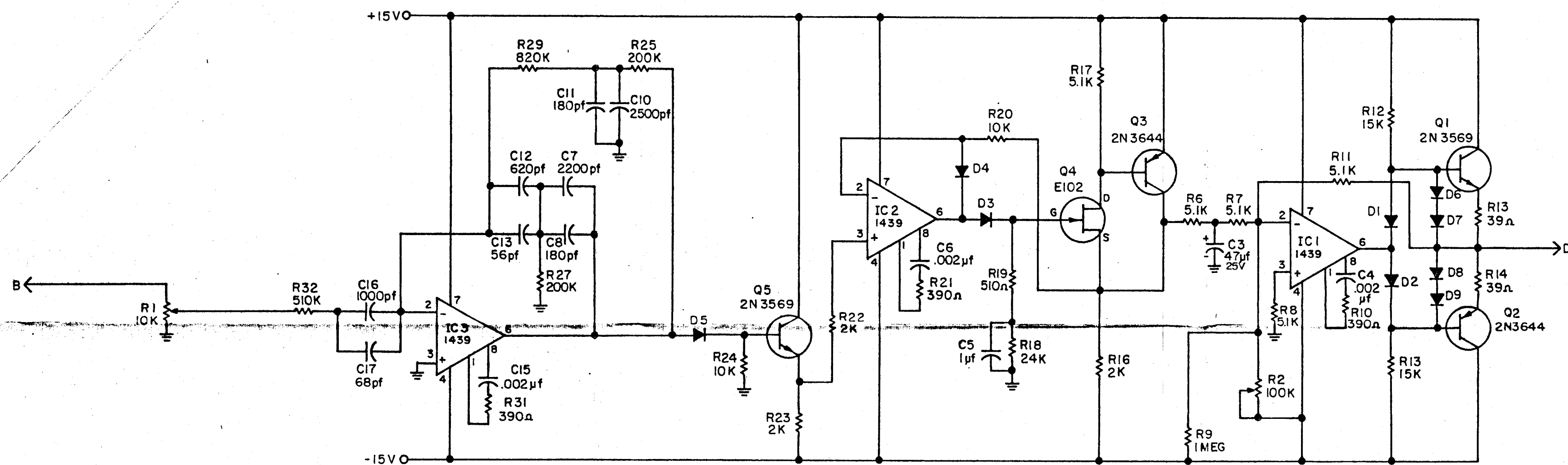


CI COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223.	
SCALE NONE	REVISION	BY E.R.	DATE 9-16-71
DATE 11-29-70			
DR'N E.R.	CR'D		
AP'VD			
TITLE PATCH PANEL ANIMATION CONTROLLER			NO. AMW-101



⊗ INDICATES COAX

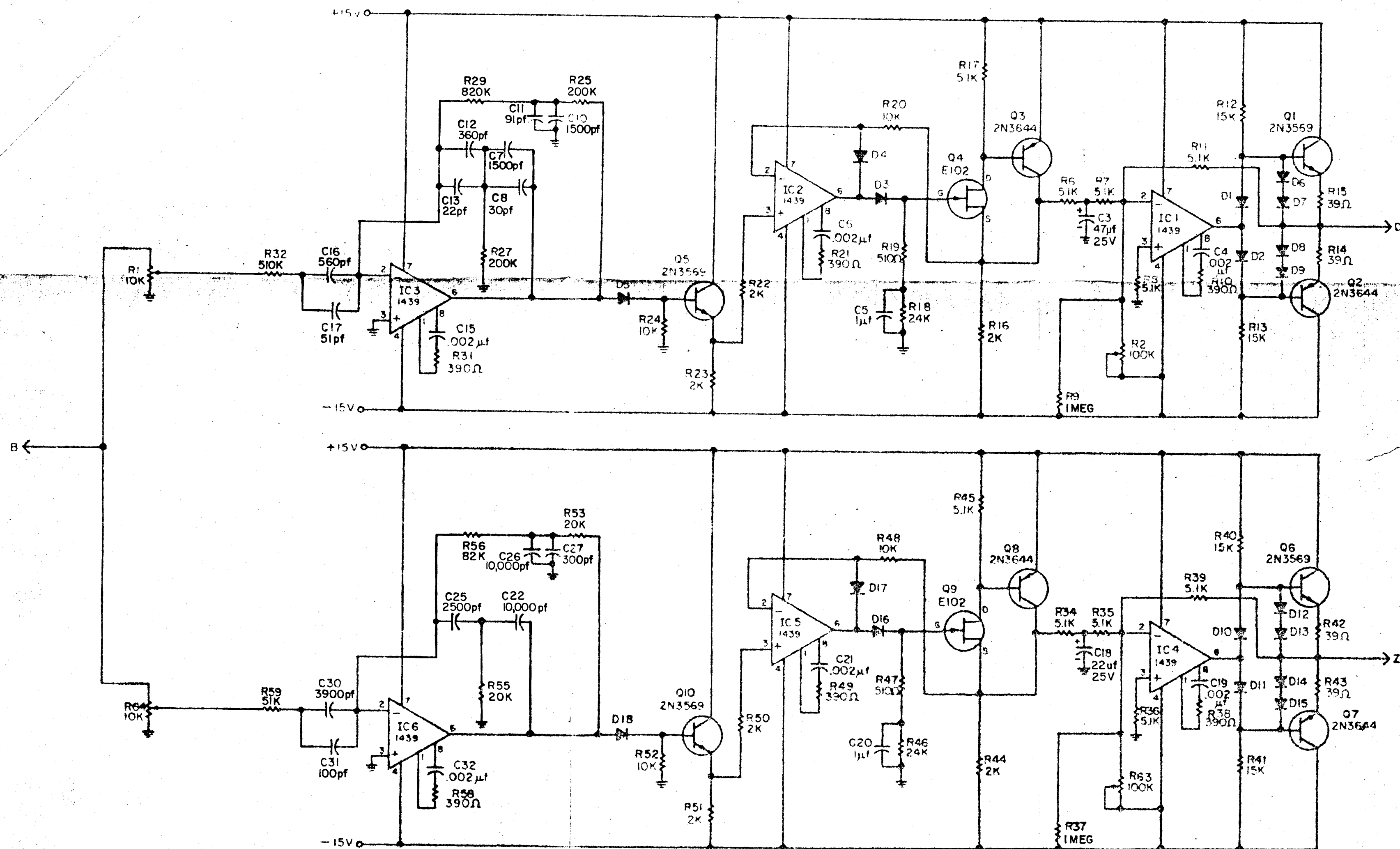
CI COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE DENVER, COLORADO 80223.	
SCALE NONE	REVISION	REV	DATE 8/9/73
DATE 8-23-71			
DR. M. E. R.	CKD.		
AP. VD.			
TITLE ANIMATION CONTROLLER PATCH PANEL WIRING DIAGRAM		NO. AMW-104 A	



NOTES

1. ALL DIODES ARE IN3064
3. ALL RESISTORS ARE 1/4W, $\pm 5\%$, UNLESS OTHERWISE SPECIFIED

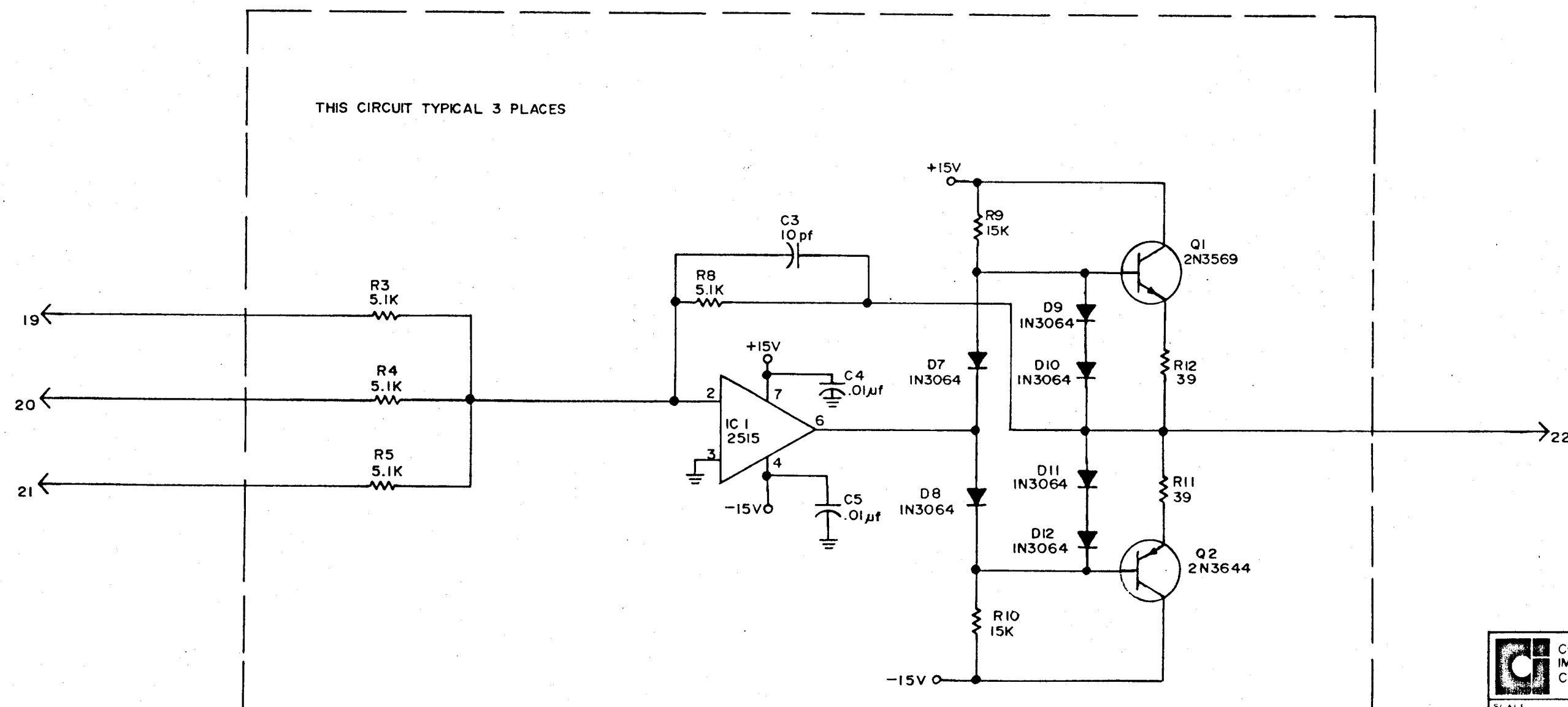
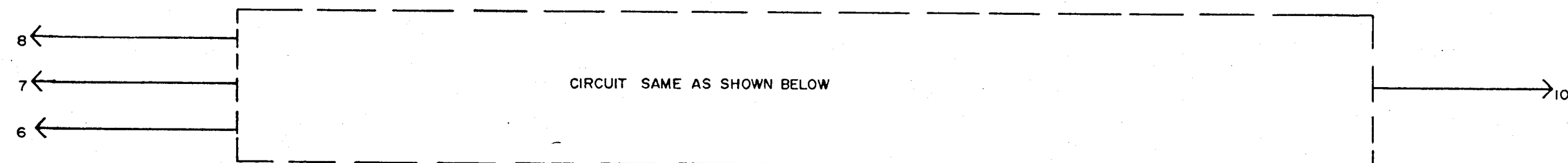
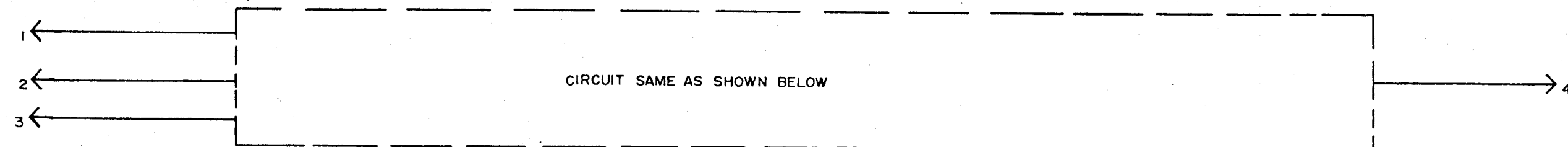
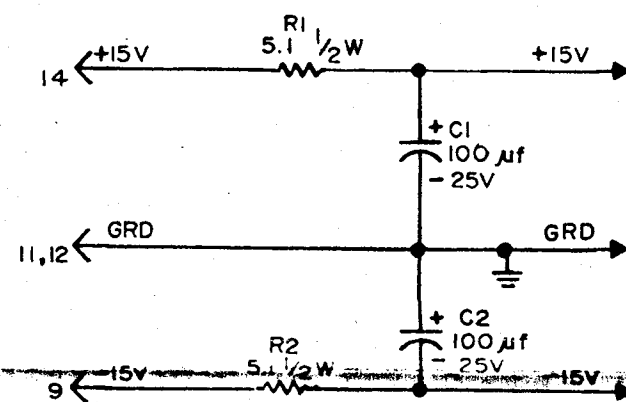
 COMPUTER IMAGE CORPORATION		2162 SOUTH JASON STREET, DENVER, COLORADO 80223.	
SCALE	REVISION	BY	DATE
DATE 10-21-72			
DR'N. Mack	CHK'D.		
APP'VD.			
TITLE BAND PASS FILTER 300 Hz ANIMATION AID		NO. AM-100-1	



NOTES:

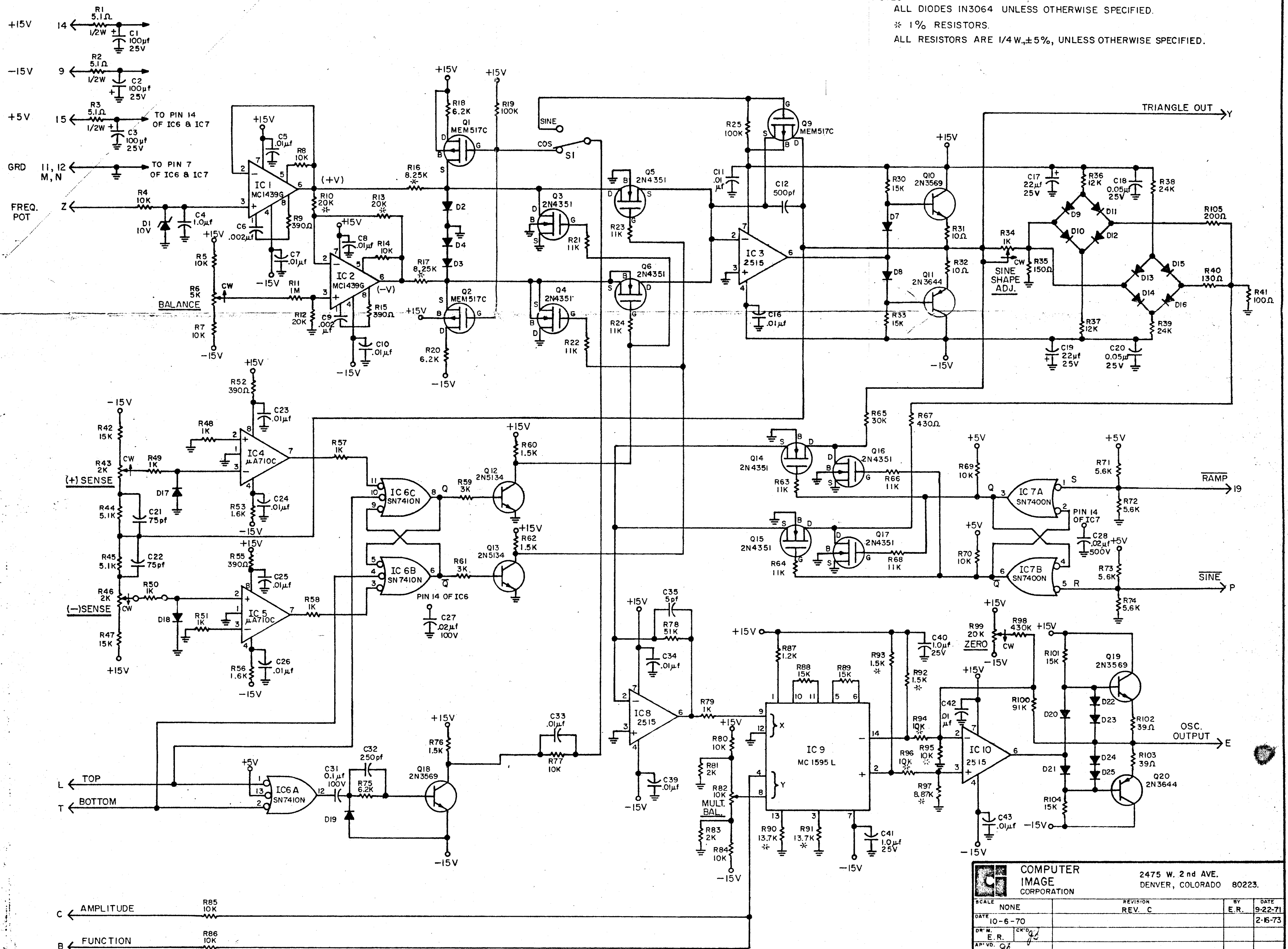
1. ALL DIODES ARE IN3064.
2. ALL RESISTORS ARE 1/4 W, ± 5%, UNLESS OTHERWISE SPECIFIED

		COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223	
SCALE	NONE	REV	004	BY	
DATE	11-23-70				
DR	E R				
AP	VE				
BAND PASS FILTER 810/530 Hz ANIMATION AID					AM-100-3



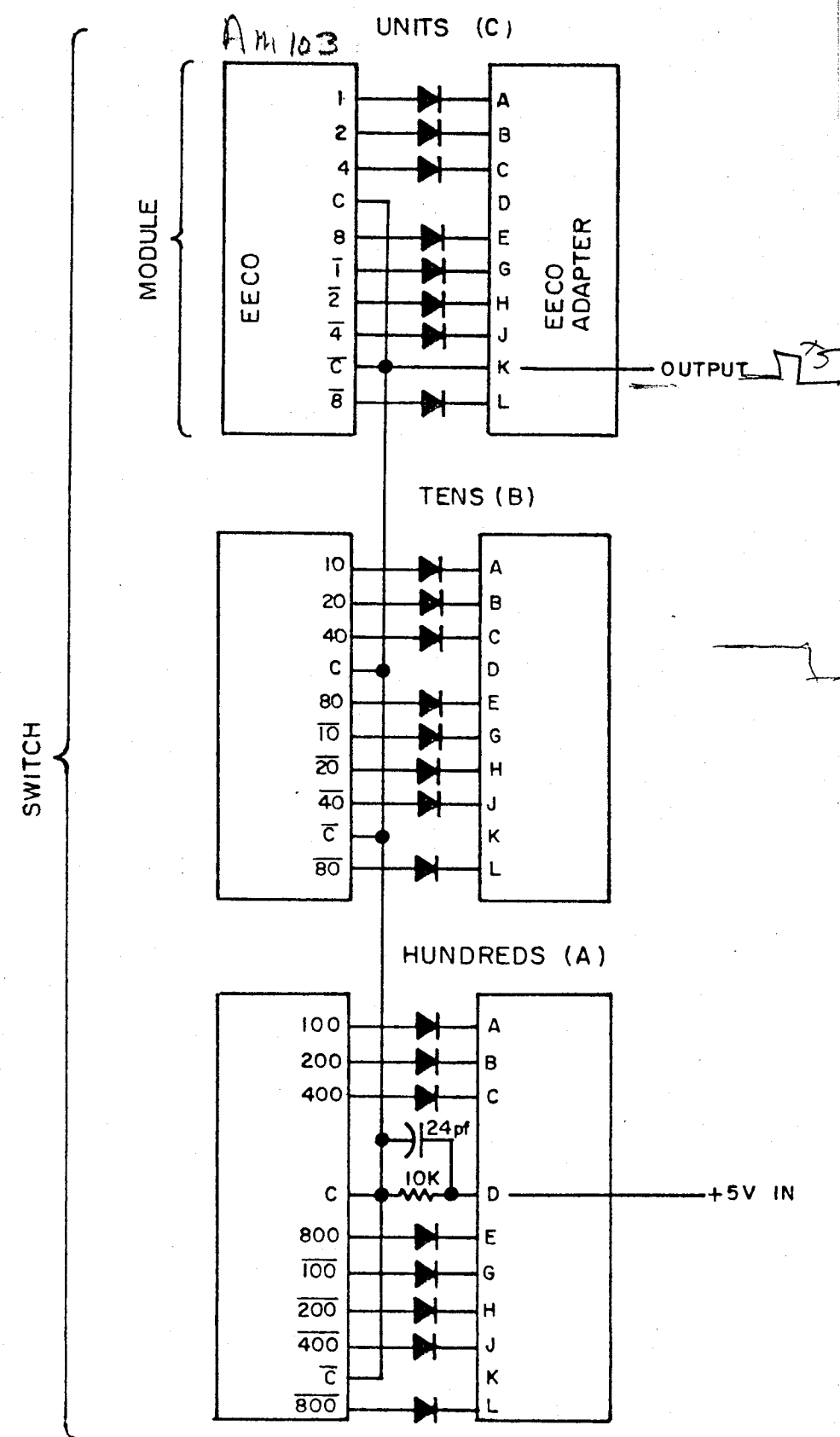
NOTE
ALL RESISTORS ARE 1/4W ±5% UNLESS OTHERWISE SPECIFIED

		2475 W 2nd AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REVISIONS	DATE
DATE	1/21/74		
DRN	R.K.P.		
APV			
TITLE		NO	
SUMMING AMP ANIMATION CONTROLLER		AM-101C	



NOTES:
 ALL DIODES IN3064 UNLESS OTHERWISE SPECIFIED.
 * 1% RESISTORS.
 ALL RESISTORS ARE 1/4 W., ±5%, UNLESS OTHERWISE SPECIFIED.

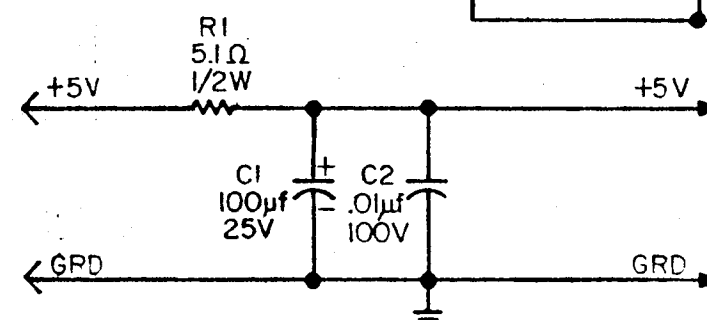
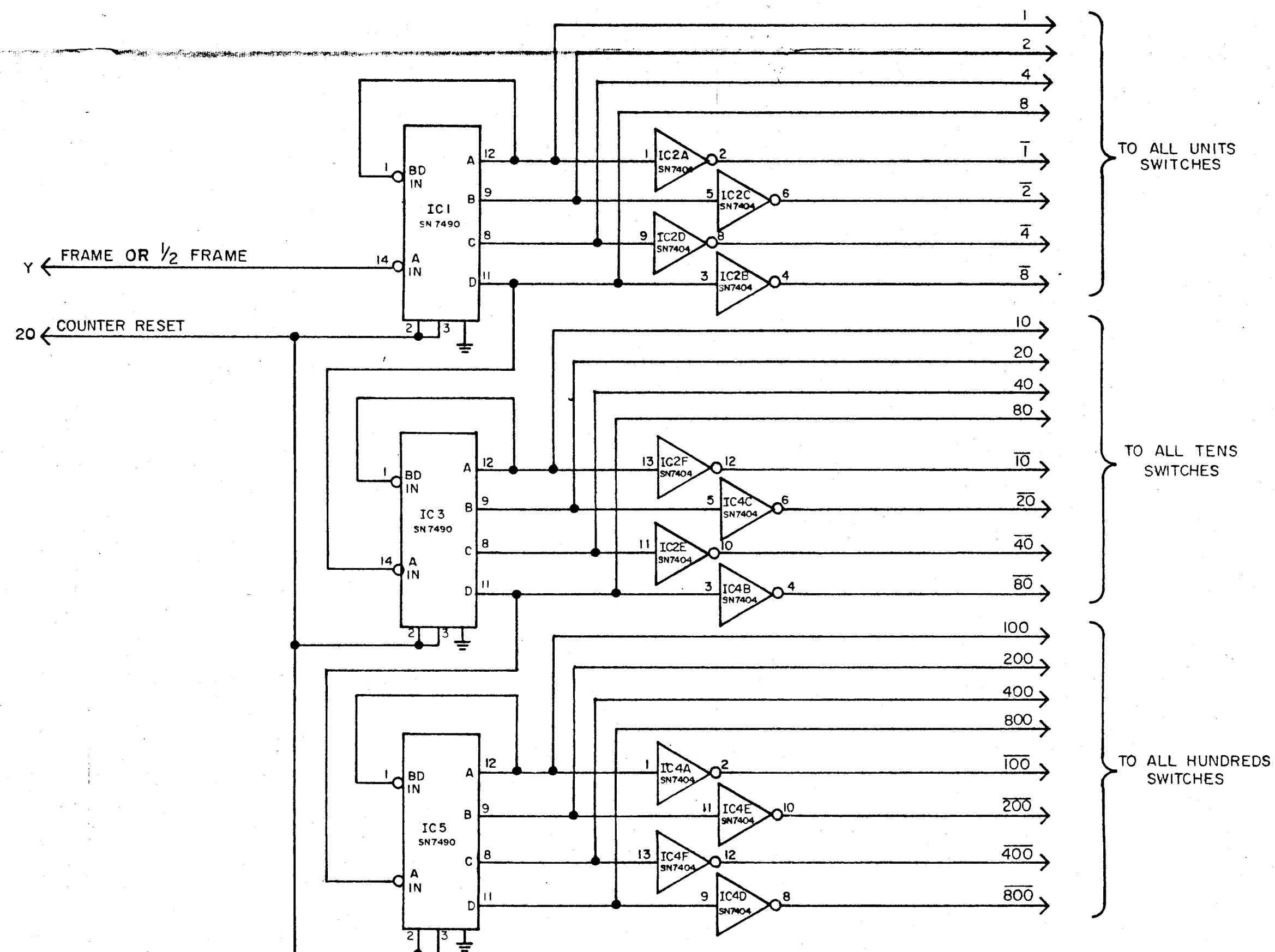
COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REVISION	REV. C
DATE	10-6-70	BY	E.R.
DATE	9-22-71	DATE	2-6-73
DR' M.	E.R.	CK'D	
AP' V.D.			
TITLE HIGH FREQUENCY OSCILLATOR ANIMATION CONTROLLER			NO. AM-102 D



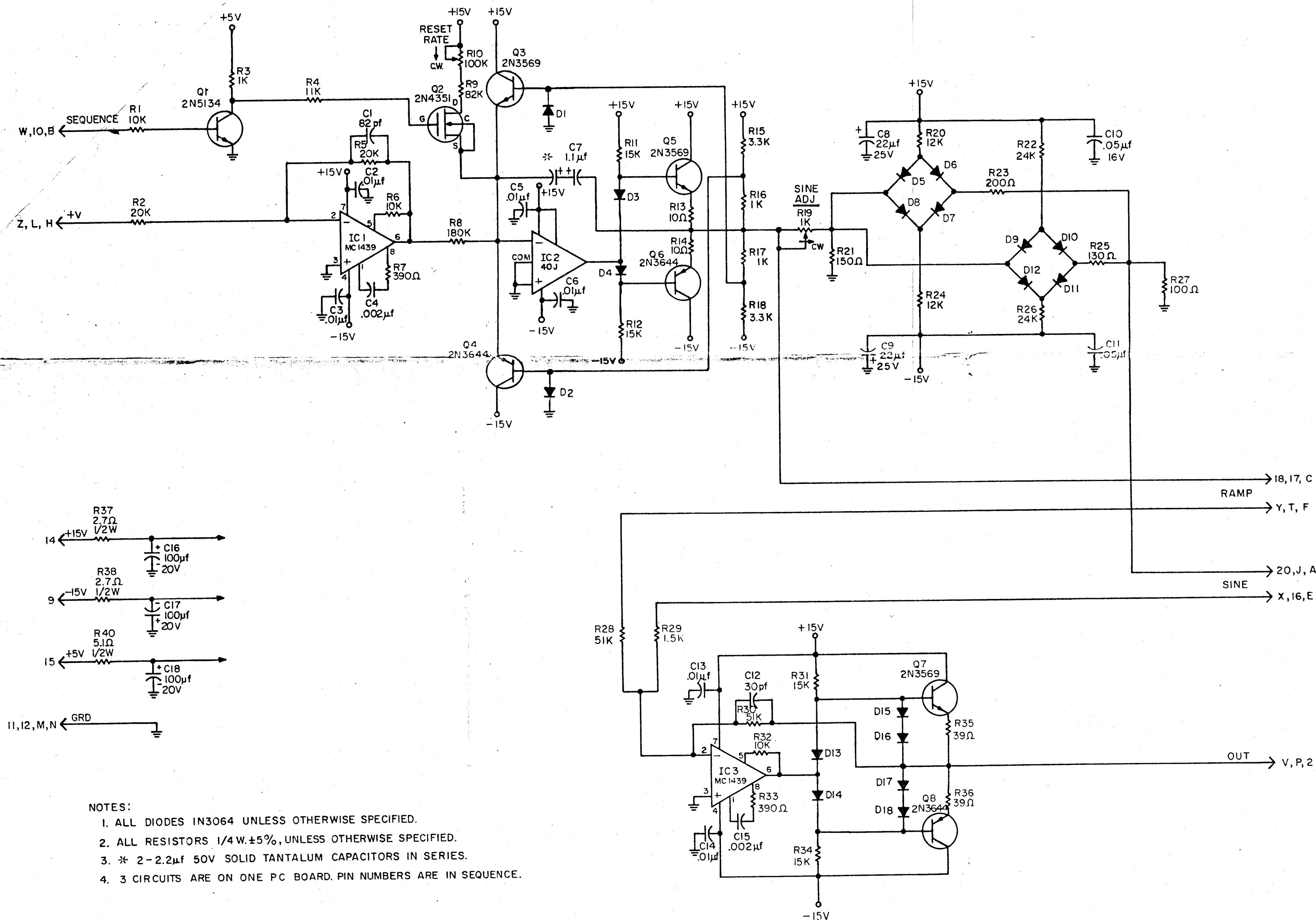
NOTES:

1. ALL DATA BITS ARE WIRED IN PARALLEL --- PIN A OF UNITS MODULE #1 TO PIN A OF UNITS MODULE #2 ETC.
2. THE 10K IN PARALELL WITH 24 pf IS ON THE MOST SIGNIFICANT MODULE OF EACH SWITCH. +5V IS ON PIN D.
3. THE OUTPUT OF EACH SWITCH IS ON PIN K OF THE UNITS MODULE.

		COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REVISION		BY	DATE
DATE	9-23-71				
DR'N.	ER.	CK'D.			
AP'VD.	J. BRANDT				
TITLE	DIGITAL SWITCH WIRING				



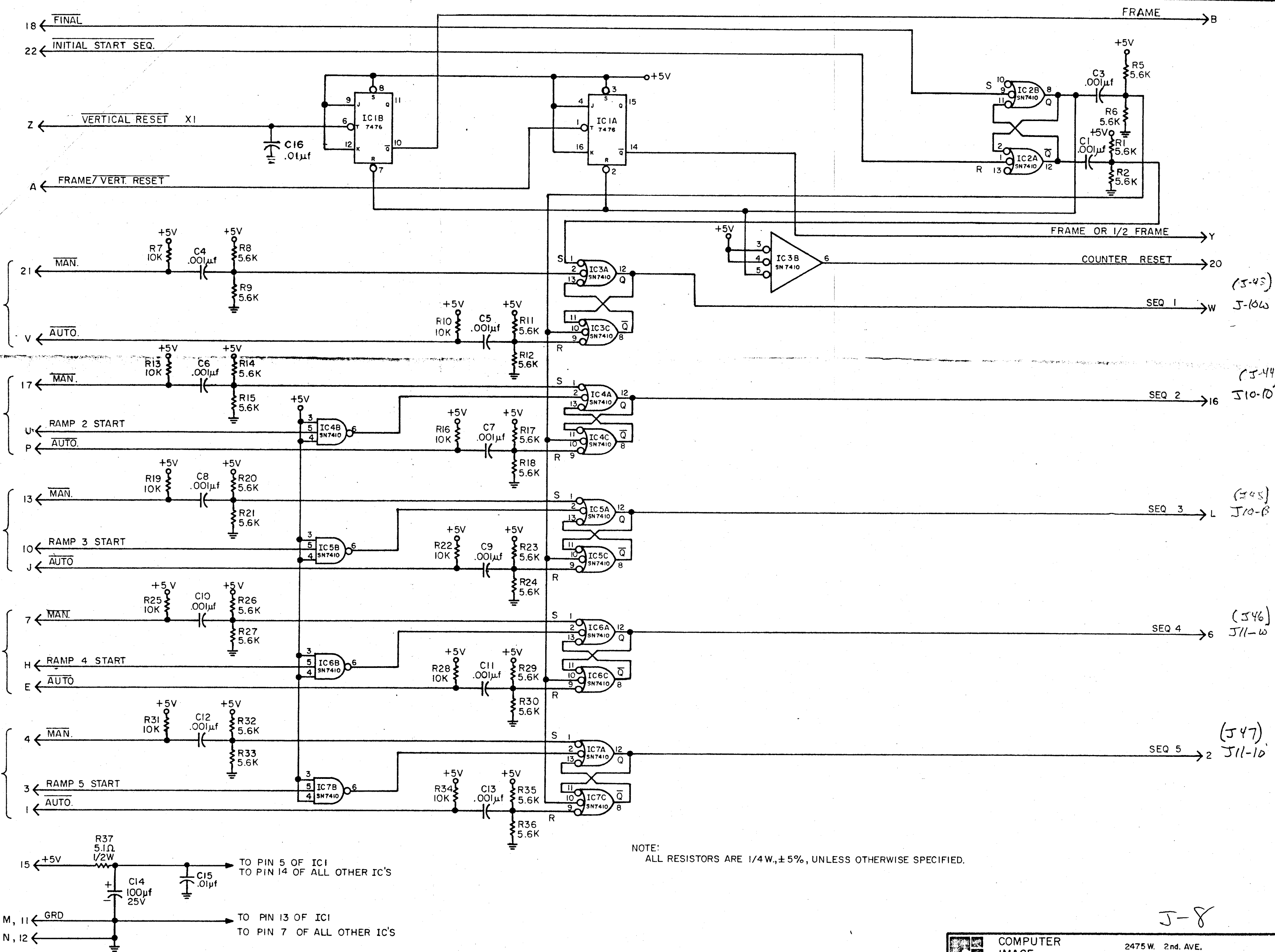
COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REVISION	BY
DATE	11-9-70		
DR'N	E.R.		
AP'VD.	96		
TITLE		NO.	
SWITCH DRIVER ANIMATION CONTROLLER		AM-103A	



NOTES:

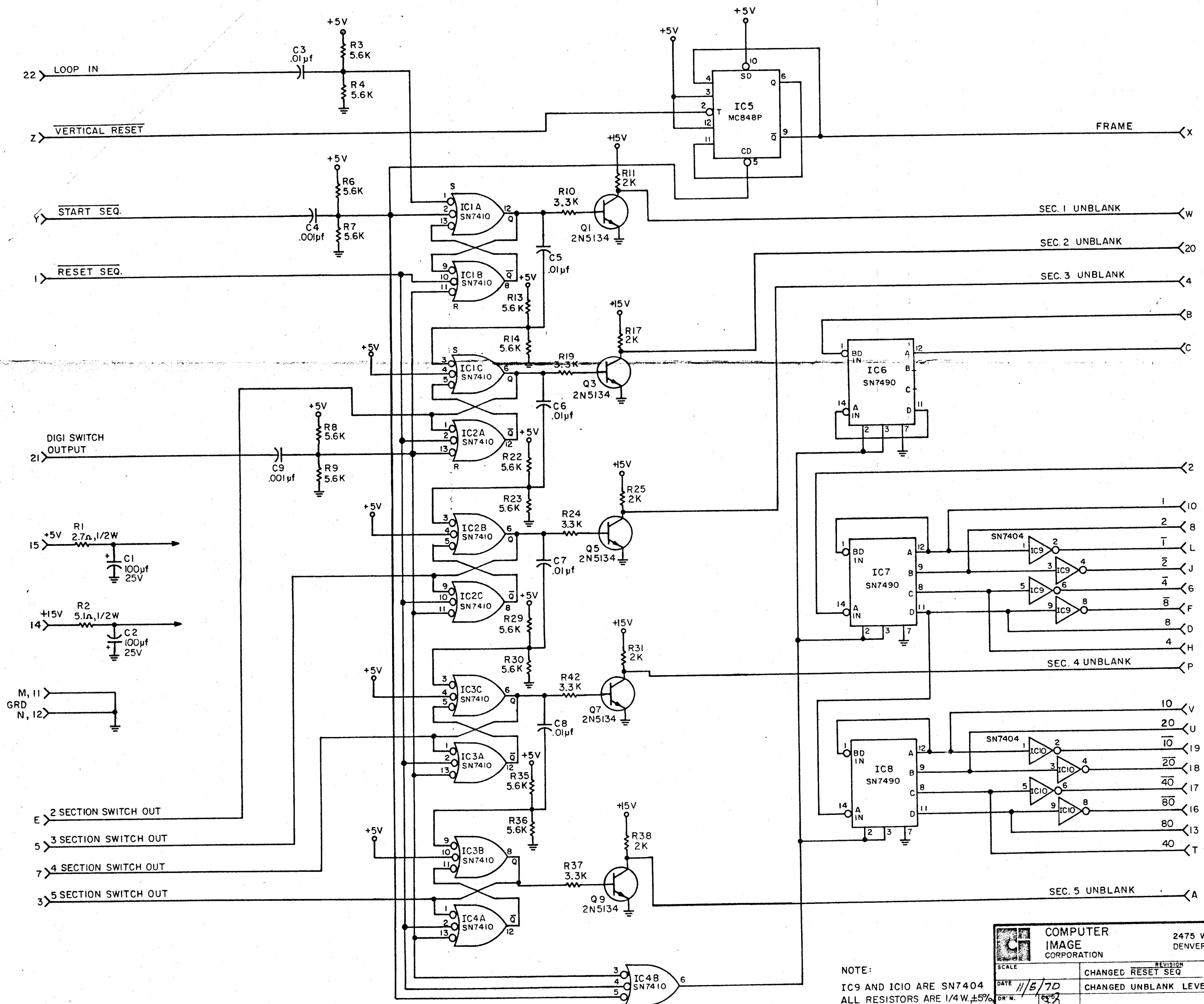
1. ALL DIODES 1N3064 UNLESS OTHERWISE SPECIFIED.
2. ALL RESISTORS 1/4W.±5%, UNLESS OTHERWISE SPECIFIED.
3. * 2-2.2μf 50V SOLID TANTALUM CAPACITORS IN SERIES.
4. 3 CIRCUITS ARE ON ONE PC BOARD. PIN NUMBERS ARE IN SEQUENCE.

		COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223	
SCALE	NONE	REVISION	CHANGED VALUE ON R15, 16, 17 & 18	BY	E.R.
DATE	10-14-70				2-11-71
DR'N	E.R.	CK'D	7/2		
AP'VD	9/2				
TITLE SEQUENCE RAMP GENERATOR ANIMATION CONTROLLER					NO. AM-104B



J-8

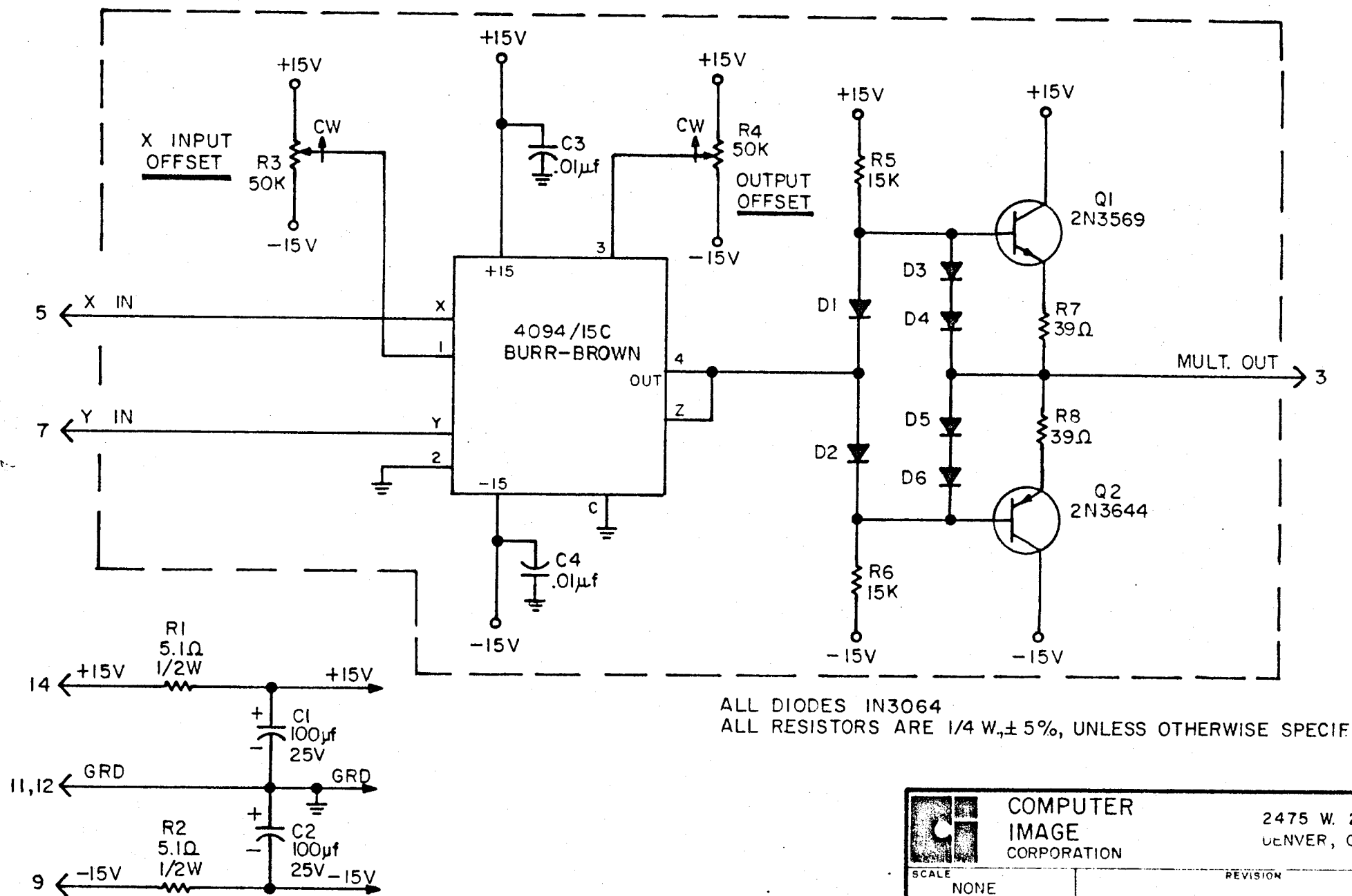
 COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REVISION	REV. C
DATE	10-14-70	BY	E.R.
DR'N	O.E.R.	CK'D	93
AP'VD	90		
TITLE SEQUENCE RAMP TIMING GENERATOR ANIMATION CONTROLLER		NO. AM-105 C	



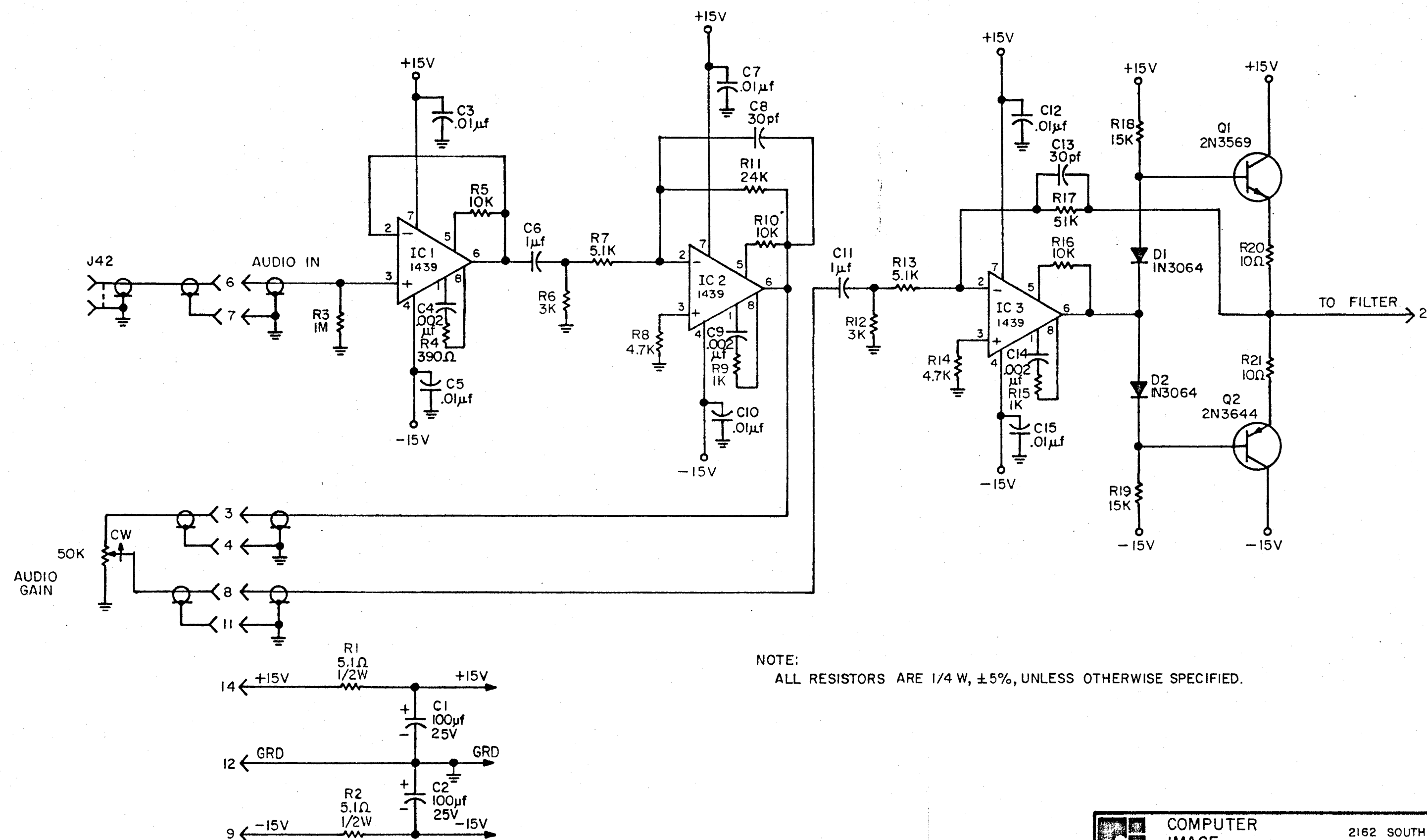
NOTE:

IC9 AND IC10 ARE SN7404
ALL RESISTORS ARE 1/4 W. ±5%
UNLESS OTHERWISE SPECIFIED.

		COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE DENVER, COLORADO 80223.	
SCALE	REVISION	BY	DATE		
	CHANGED RESET SEQ	E.R.	2-11-71		
DATE 11/5/70	CHANGED UNBLANK LEVELS	E.R.	3-2-71		
DR. N. 103		E.R.	9-17-71		
TITLE SEQUENTIAL INTENSITY GENERATOR ANIMATION CONTROLLER				NO. AM-106 C	

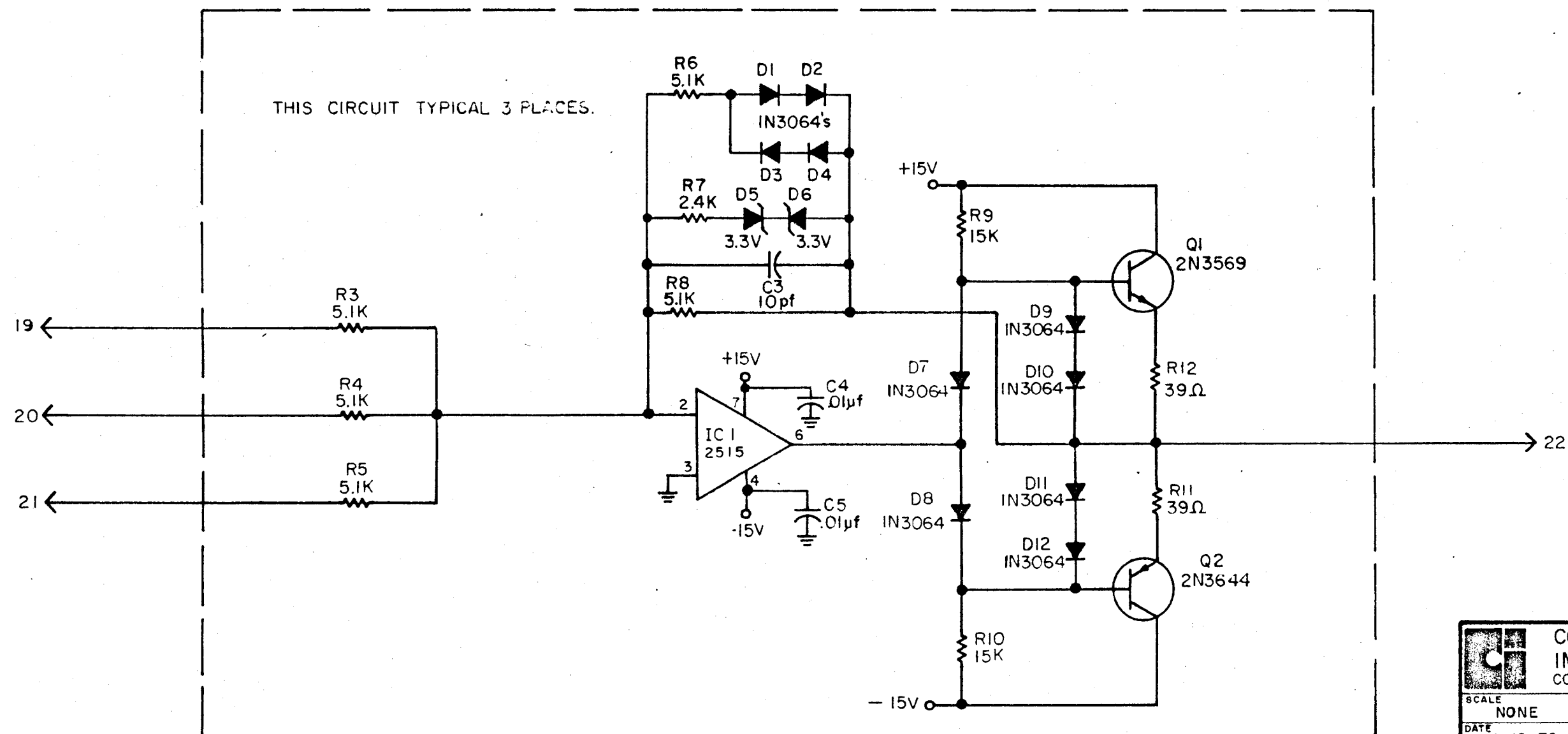
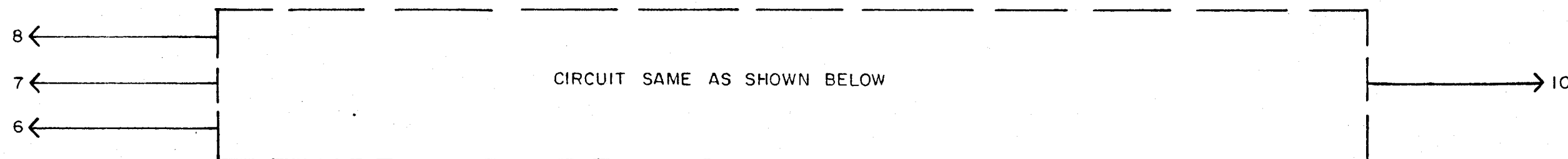
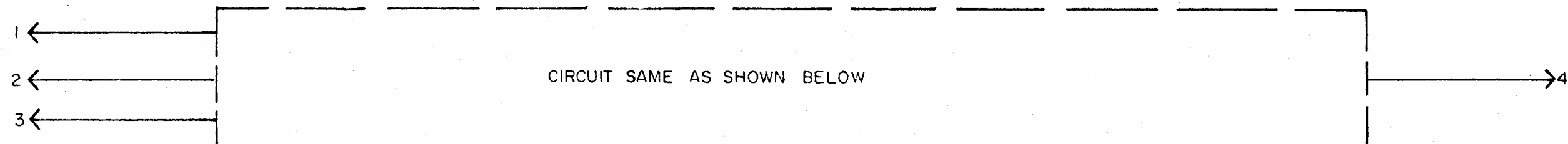
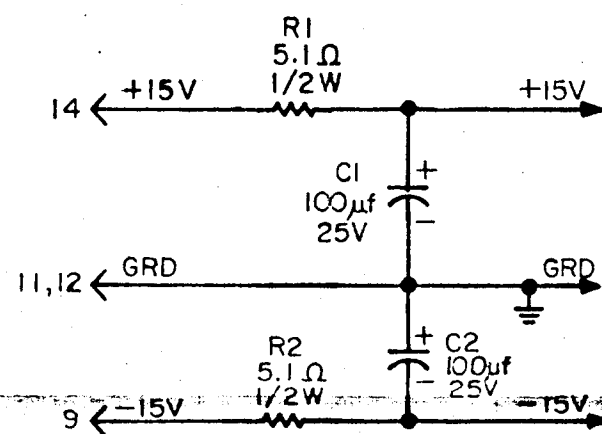


	COMPUTER IMAGE CORPORATION		2475 W. 2nd. AVE. DENVER, COLORADO 80223.	
	SCALE NONE	REVISION	BY	DATE
DATE 11-7-70				
DR'W. E.R.	CK'D. J.B.			
AP'D J.B.				
TITLE MULTIPLIER CARD ANIMATION CONTROLLER			NO AM-107	



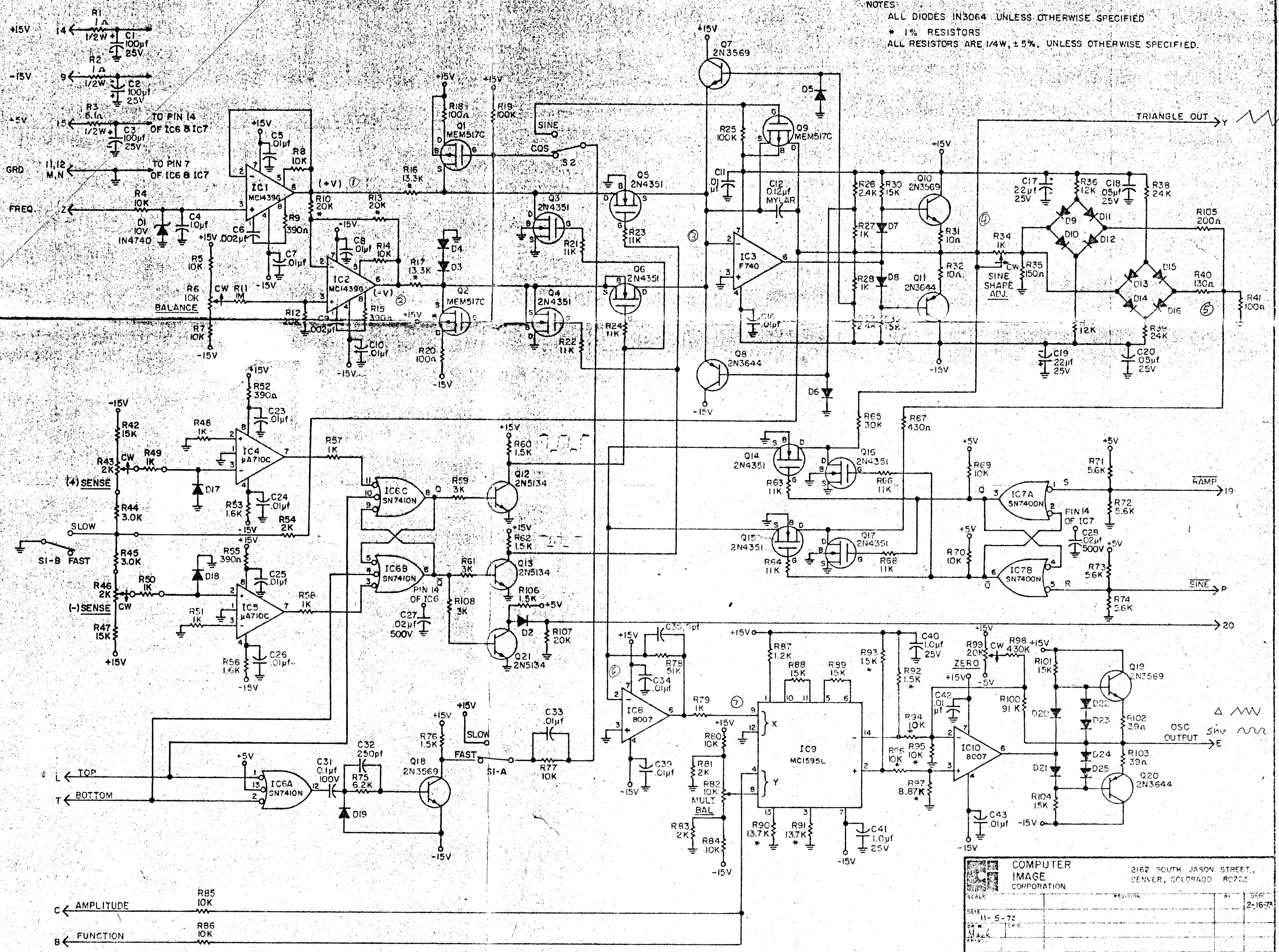
NOTE:
ALL RESISTORS ARE 1/4 W, $\pm 5\%$, UNLESS OTHERWISE SPECIFIED.

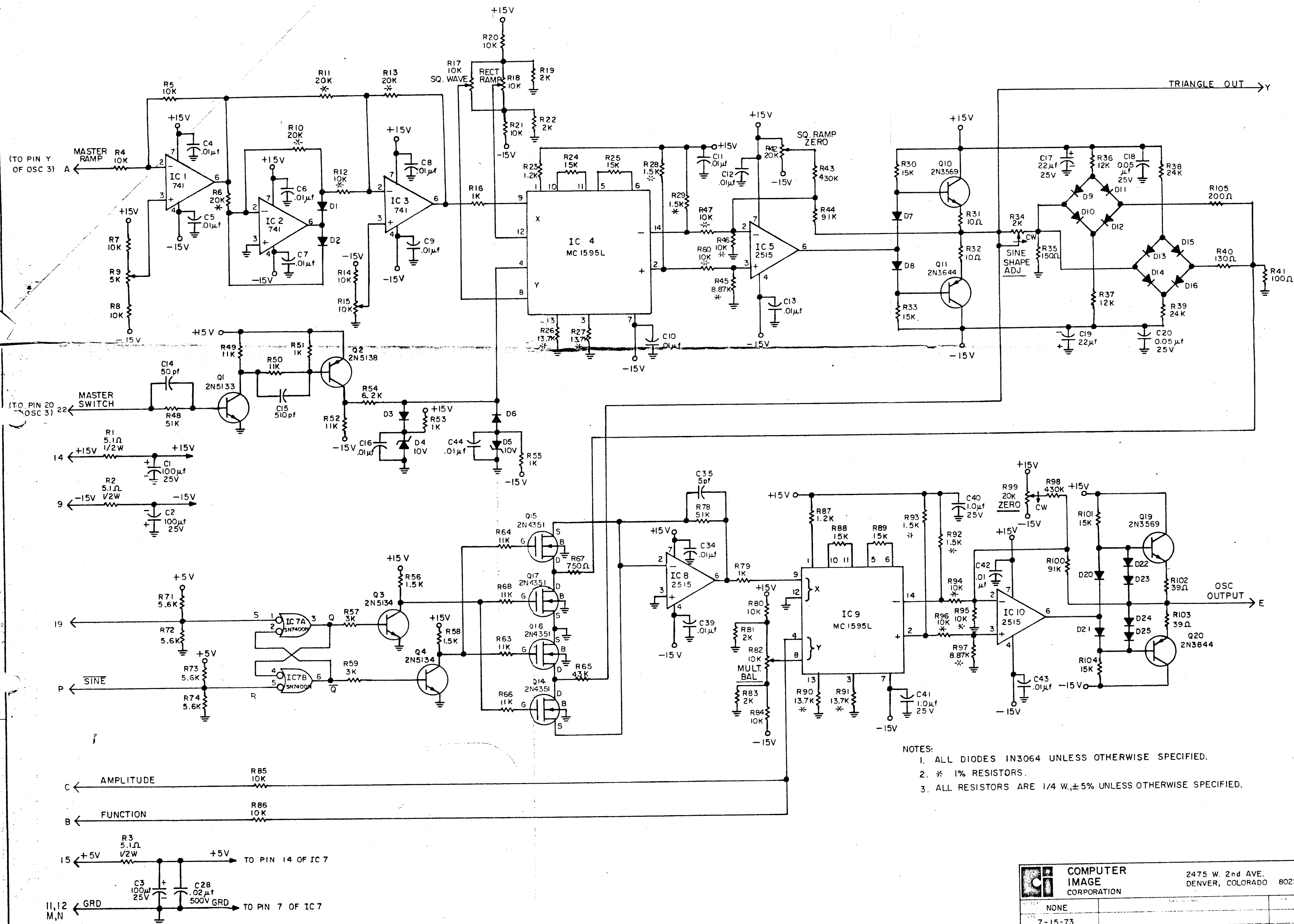
CI COMPUTER IMAGE CORPORATION		2162 SOUTH JASON STREET, DENVER, COLORADO 80223.	
SCALE NONE	REVISION	BY	DATE
DATE 11-10-70			
DR'N E.R.	CK'D J.B.		
TITLE AUDIO PREAMPLIFIER ANIMATION CONTROLLER		NO. AM-108 A	



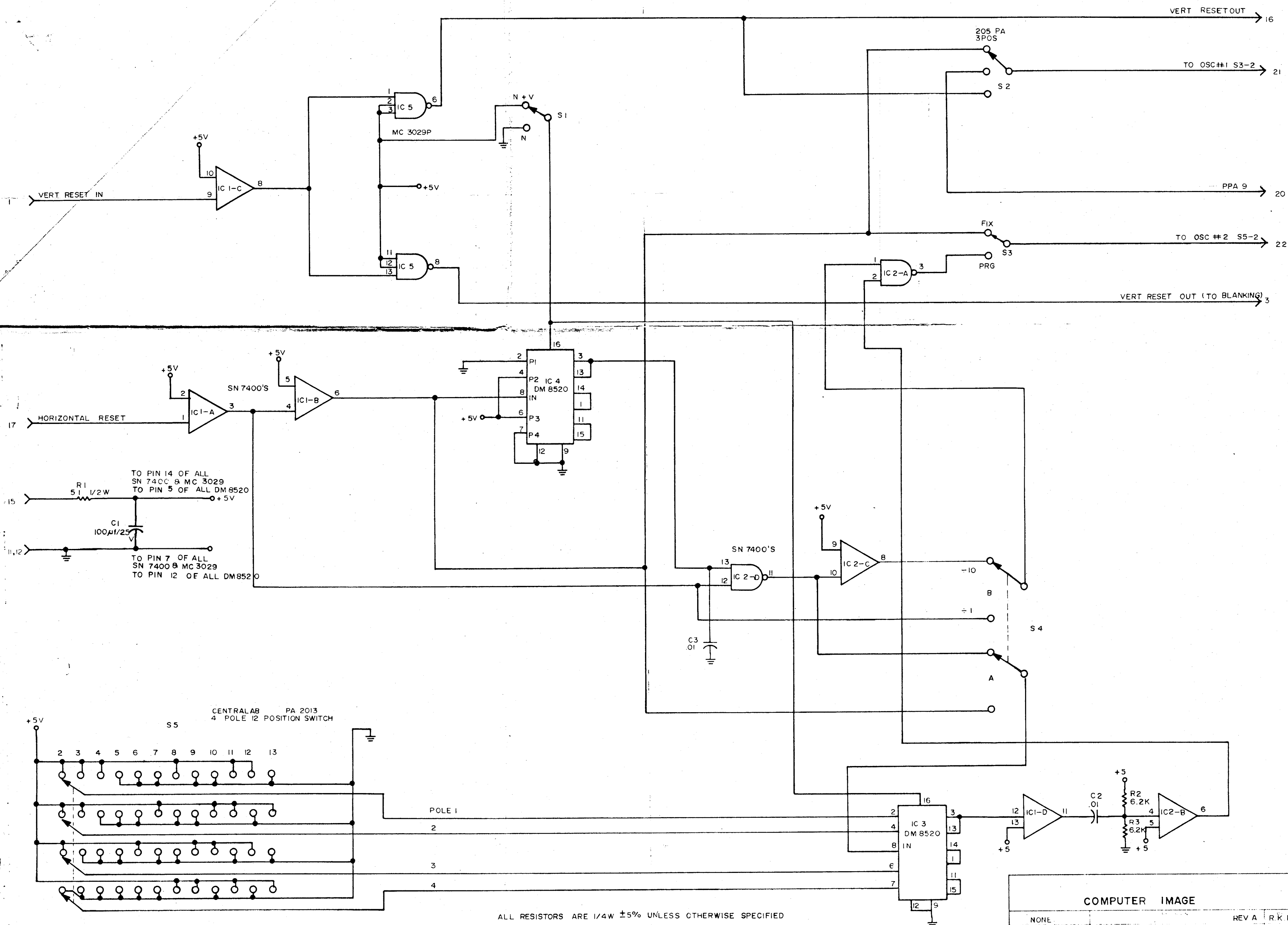
NOTE: ALL RESISTORS ARE 1/4 W, ±5%, UNLESS OTHERWISE SPECIFIED.

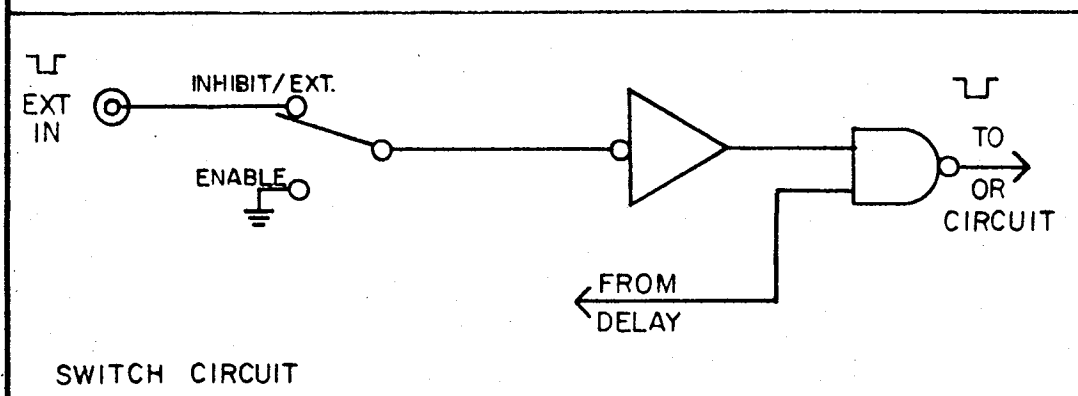
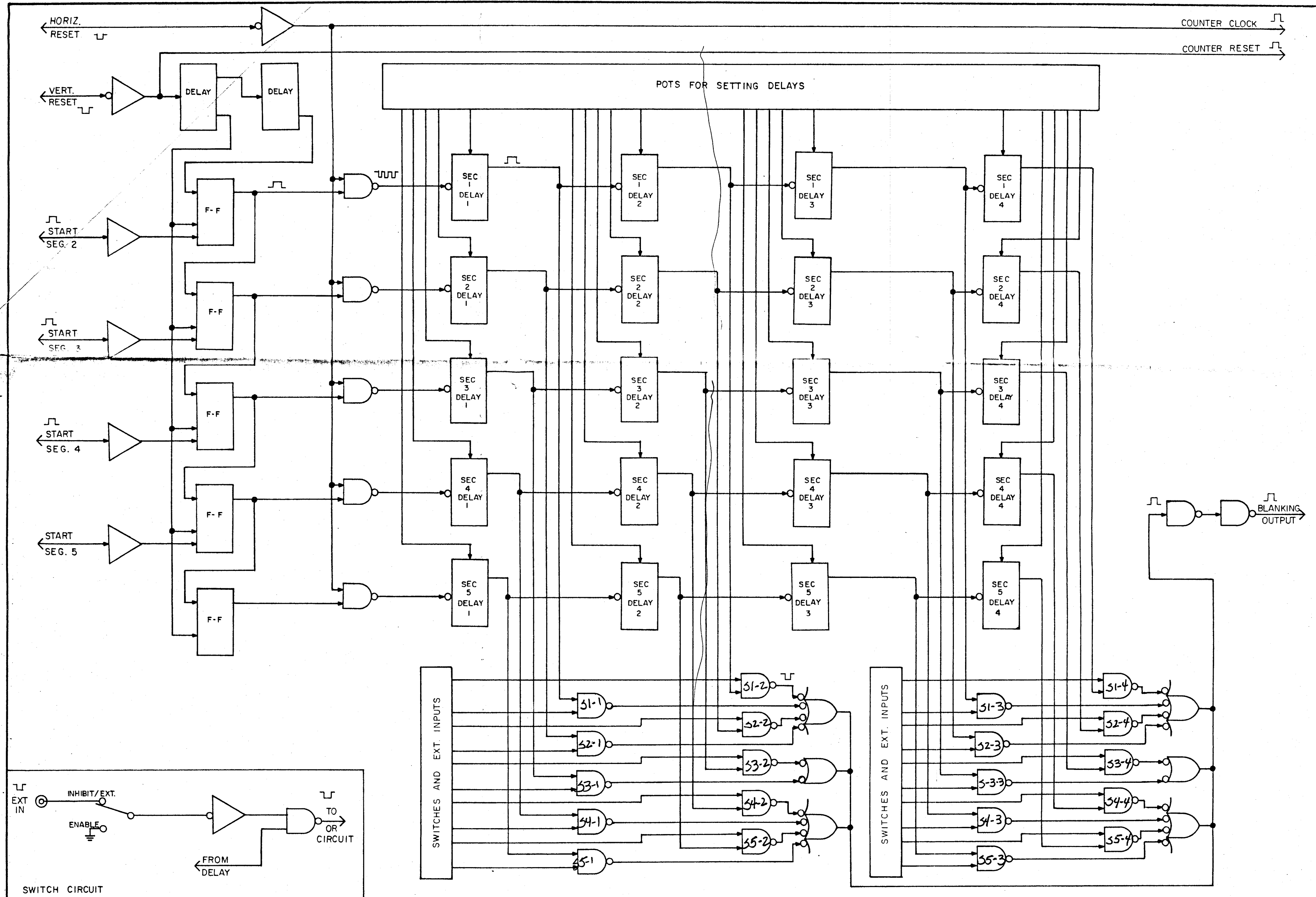
COMPUTER IMAGE CORPORATION		2475 W. 2nd. AVE. DENVER, COLORADO 80223	
SCALE	NONE	REVISION	B
DATE	11-19-70	BY	E.R.
DR'N	E.R.	CHECKED	
AP'VD			
TITLE			NO.
ANIMATION CONTROLLER AUDIO LIMITER			AM-110





COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223.	
DATE	NONE	REV	DATE
TESTED	7-15-73	BY	
DESIGNED	E.R.	BY	
SLAVED COSINE GENERATOR ANIMATION CONTROLLER		AM-112 A	

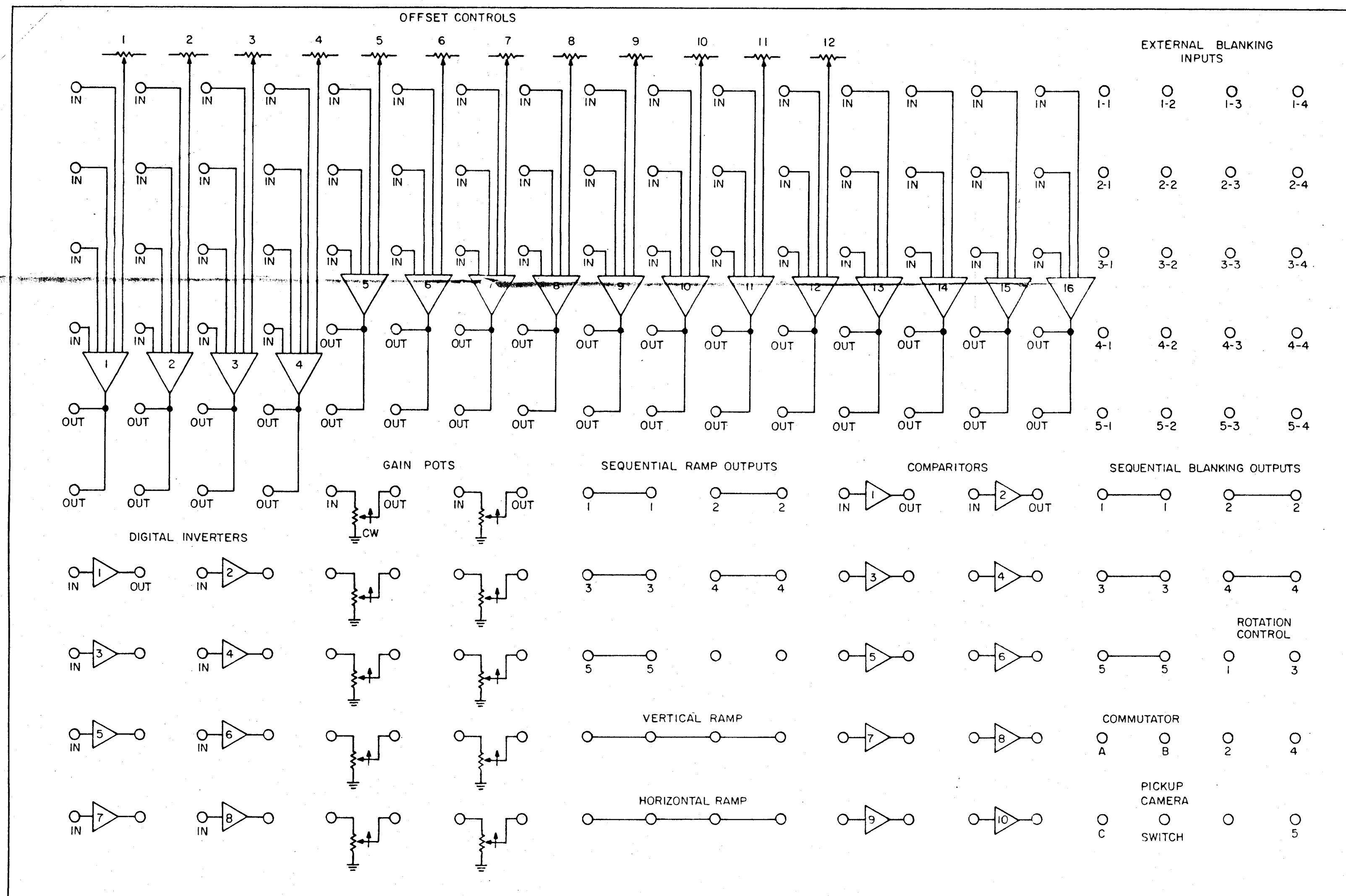




		COMPUTER IMAGE CORPORATION		2475 W. 2nd. AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REVISION		BY	DATE
DATE	11-15-72				
DRAWN	E. R.	CHECKED			
APPROVED					
TITLE RASTER SEGMENT BLANKING BLOCK DIAGRAM					NO. RSB-B-100

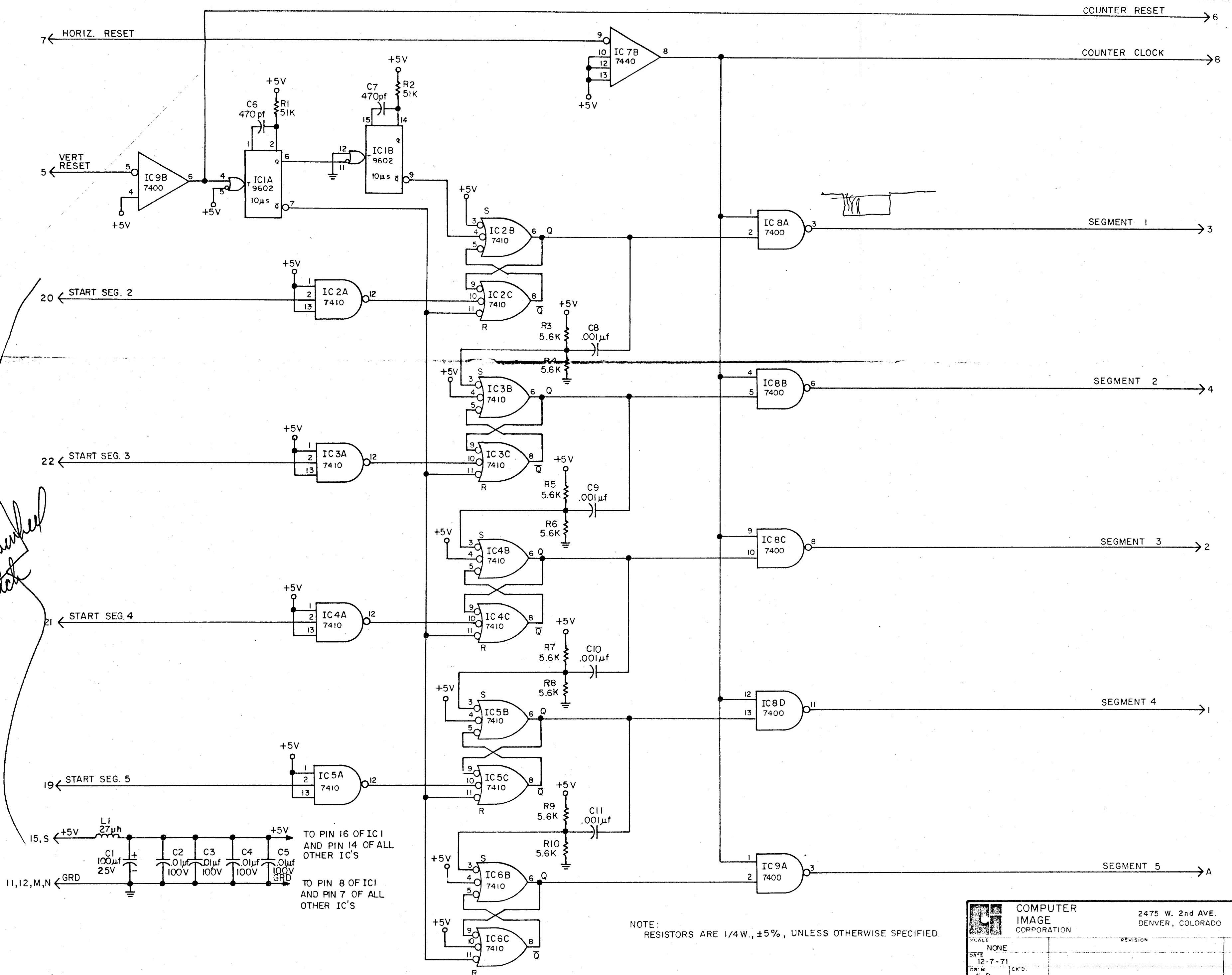
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

A
B
C
D
E
F
G
H
I
J



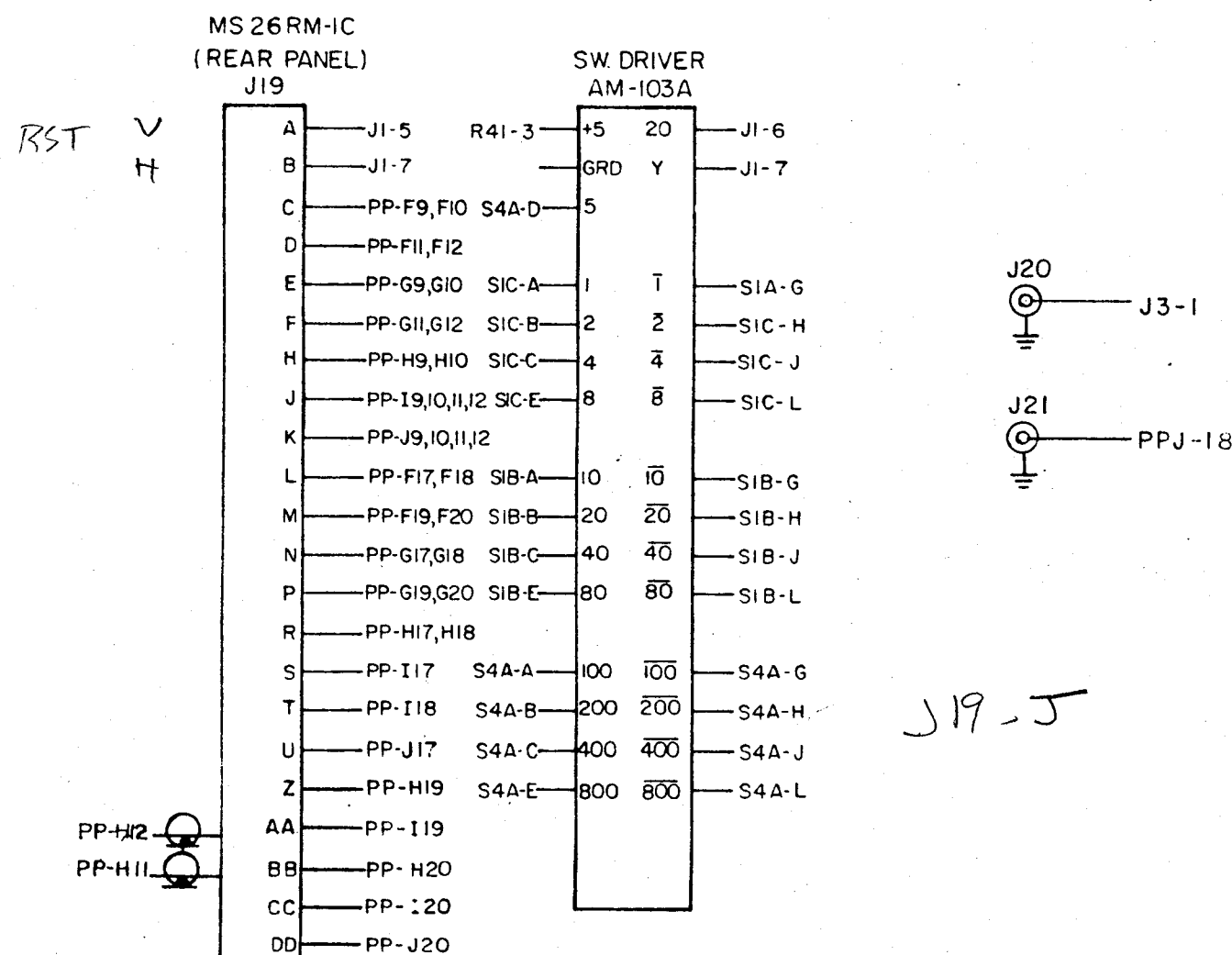
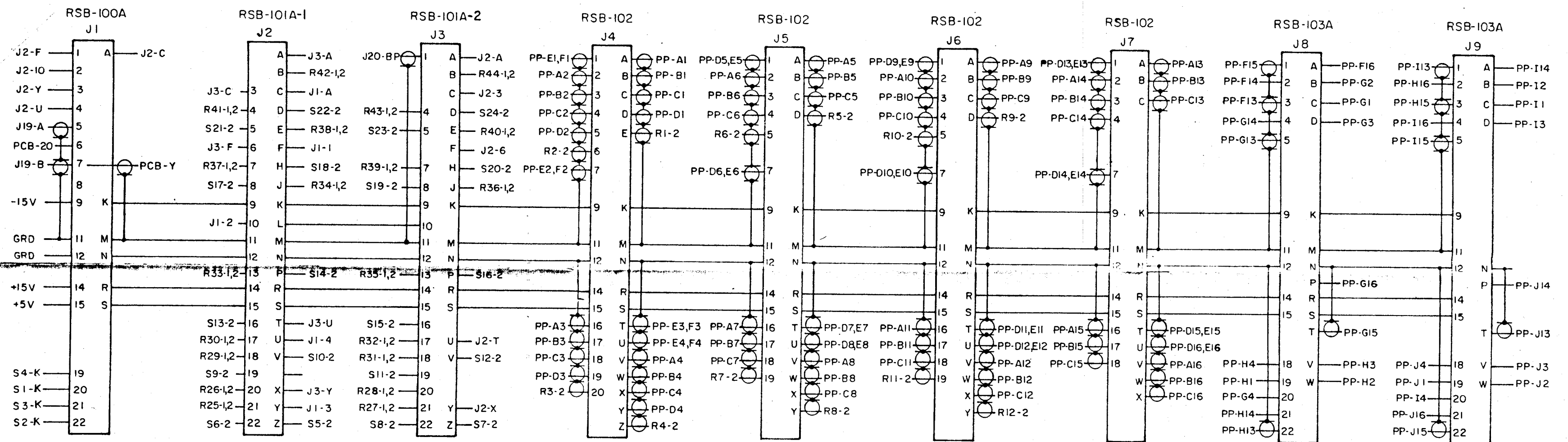
		COMPUTER IMAGE CORPORATION		2475 W. 2nd. AVE. DENVER, COLORADO 80223	
SCALE	REVISION		BY	DATE	
DATE	11-15-72				
DR'M	Mack		CK'D		
AP'VD					
TITLE			RASTER SEGMENT BLANKING PATCH PANEL		

*Thumbnails
Switch*

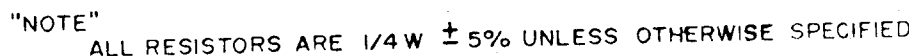


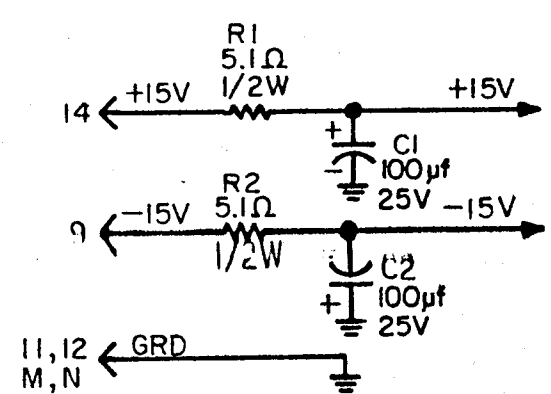
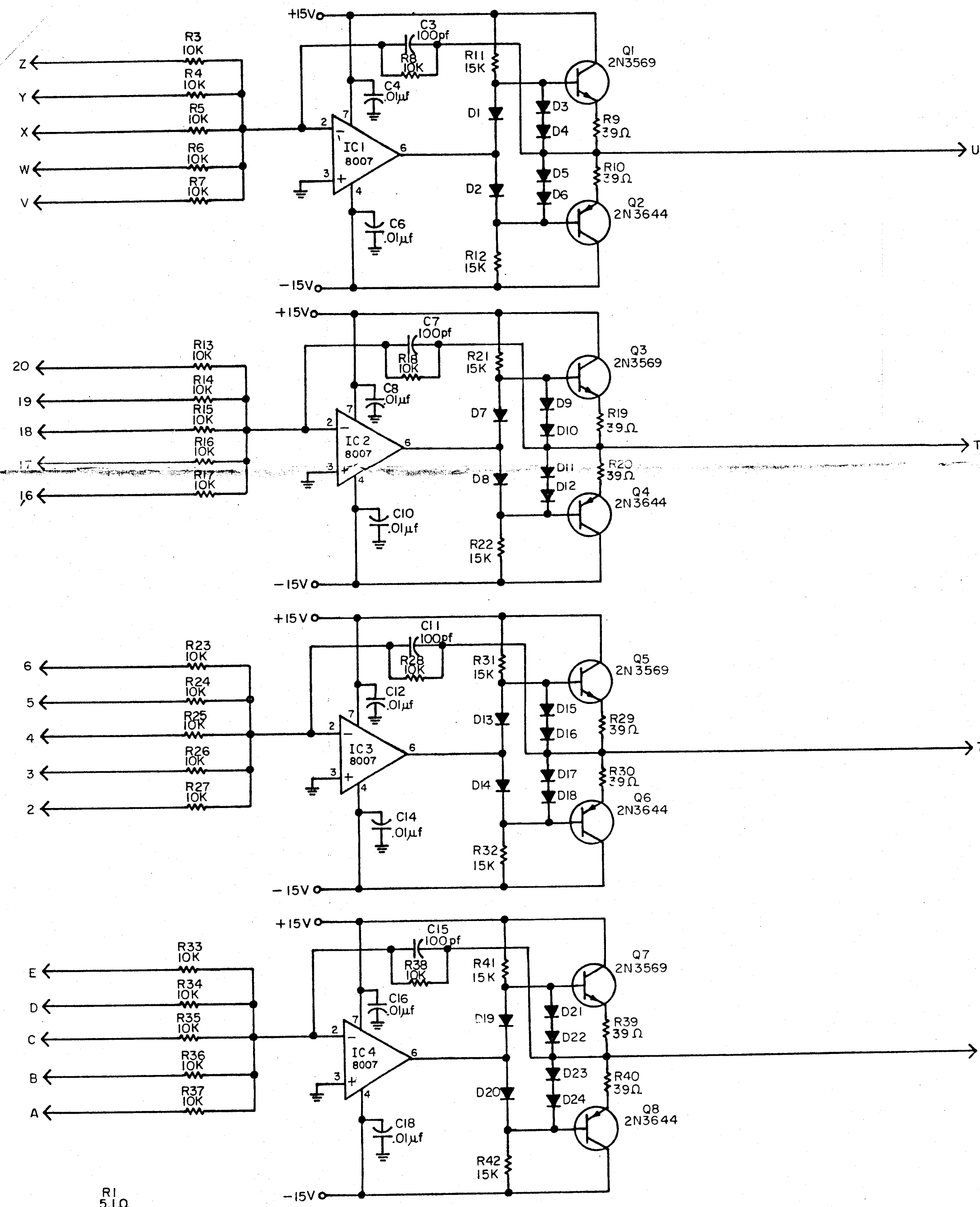
NOTE:
RESISTORS ARE 1/4W., ±5%, UNLESS OTHERWISE SPECIFIED.

 COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REVISION	BY
DATE	12-7-71	DATE	
DRW	E.R.	CHKD	
AP'D			
TITLE BLANKING SEQUENCE TIMING GEN.		NO. RSB-100	



COMPUTER IMAGE CORPORATION		DENVER, COLORADO 80223	
SCALE	None	REVISION	REV R.K.P.
DATE	9-14-72	BY	DATE
DR'N	MAC	CK'D.	
AP'VD.			
TITLE		NO.	
BLANKING CONTROLLER WIRING DIAG.		RSBW-100-1	

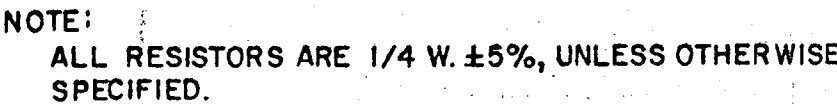




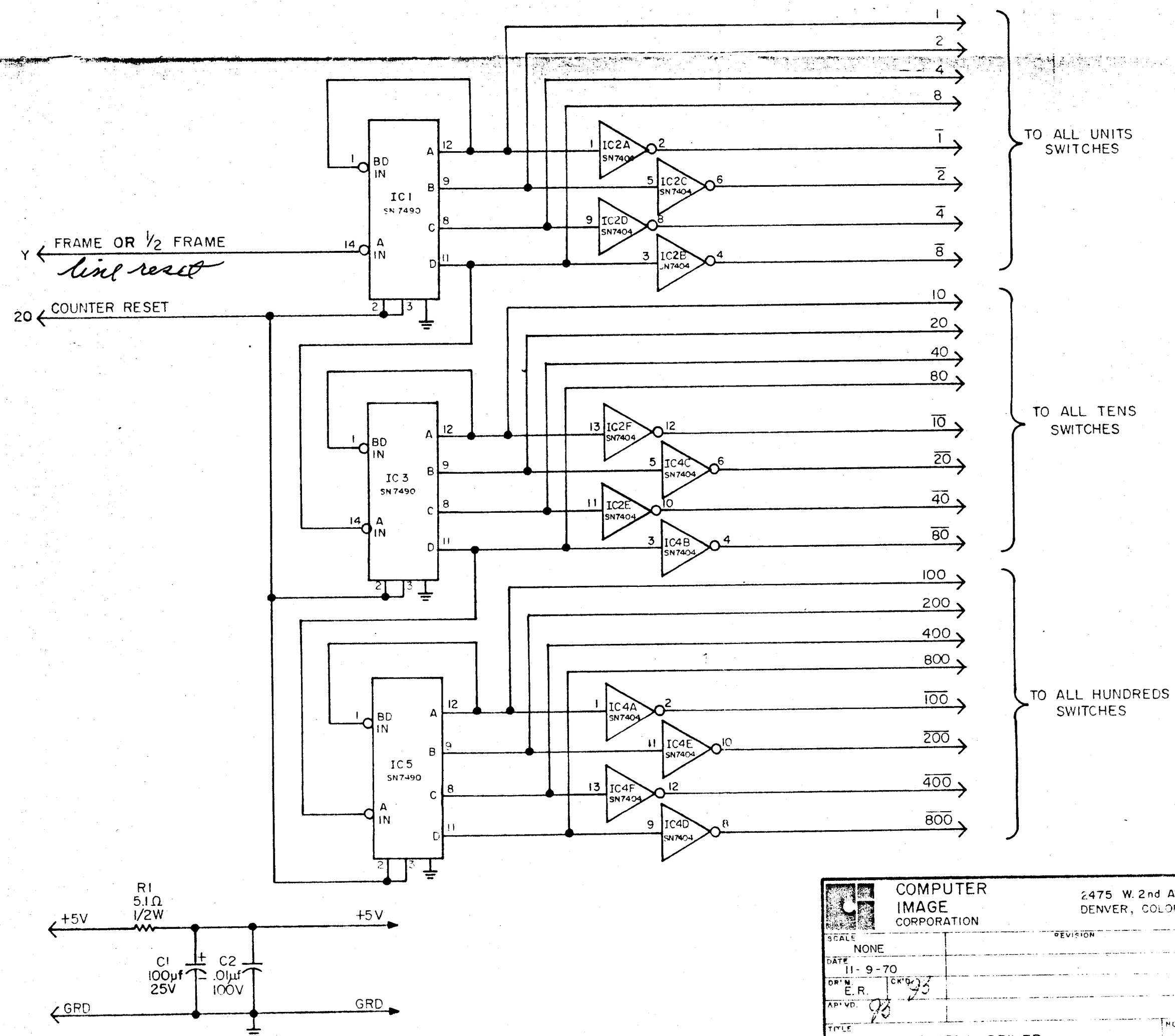
NOTE:

RESISTORS ARE 1/4 W. ± 5%, UNLESS OTHERWISE SPECIFIED.

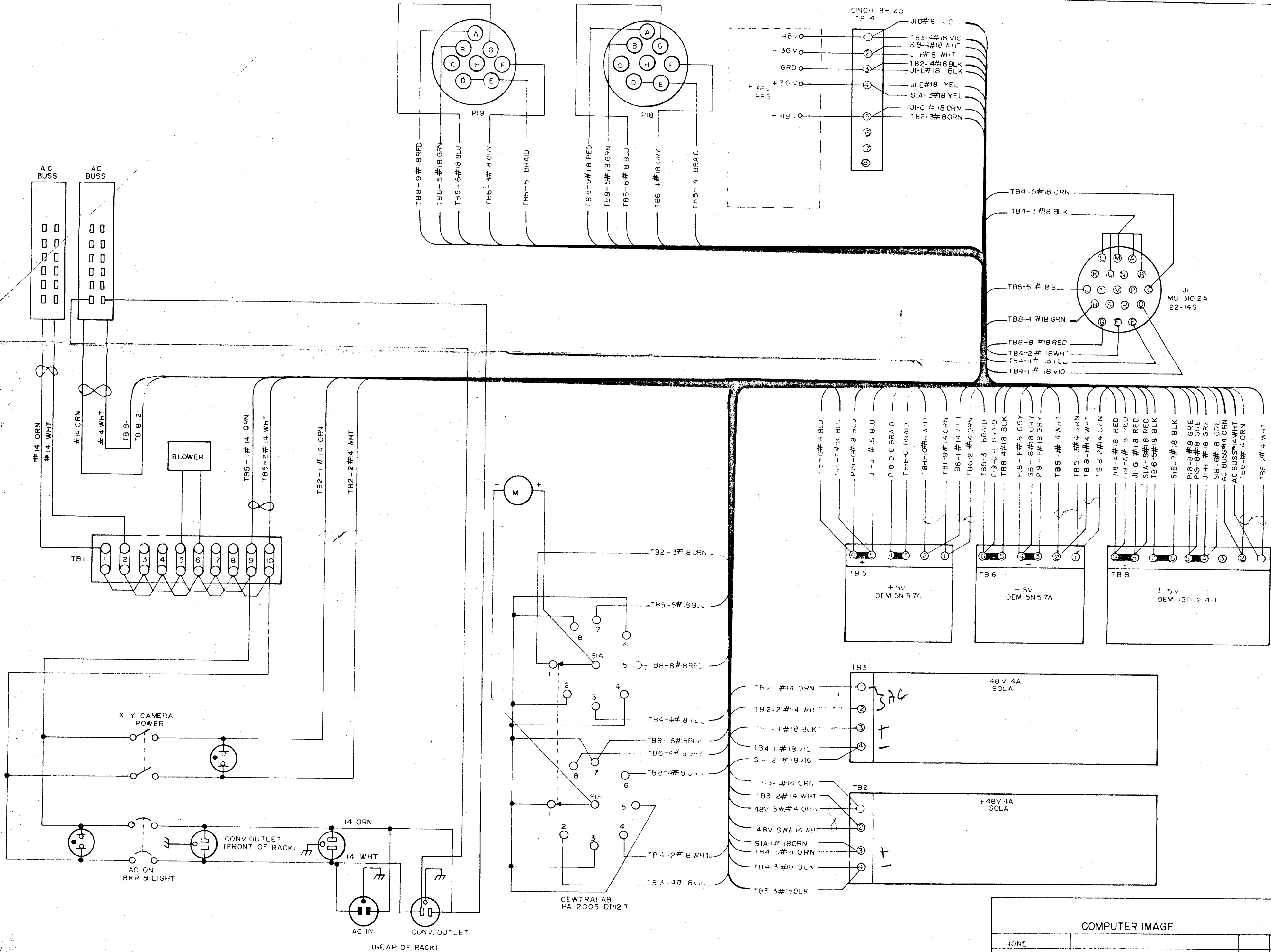
COMPUTER IMAGE CORPORATION		2475 W. 2nd. AVE. DENVER, COLORADO 80223.	
SCALE	NONE	REVISION	BY
DATE	6-17-71		
DRN	E.R.	CKD	
AP'D			
TITLE SUMMING AMPLIFIER			NO. RSB-102



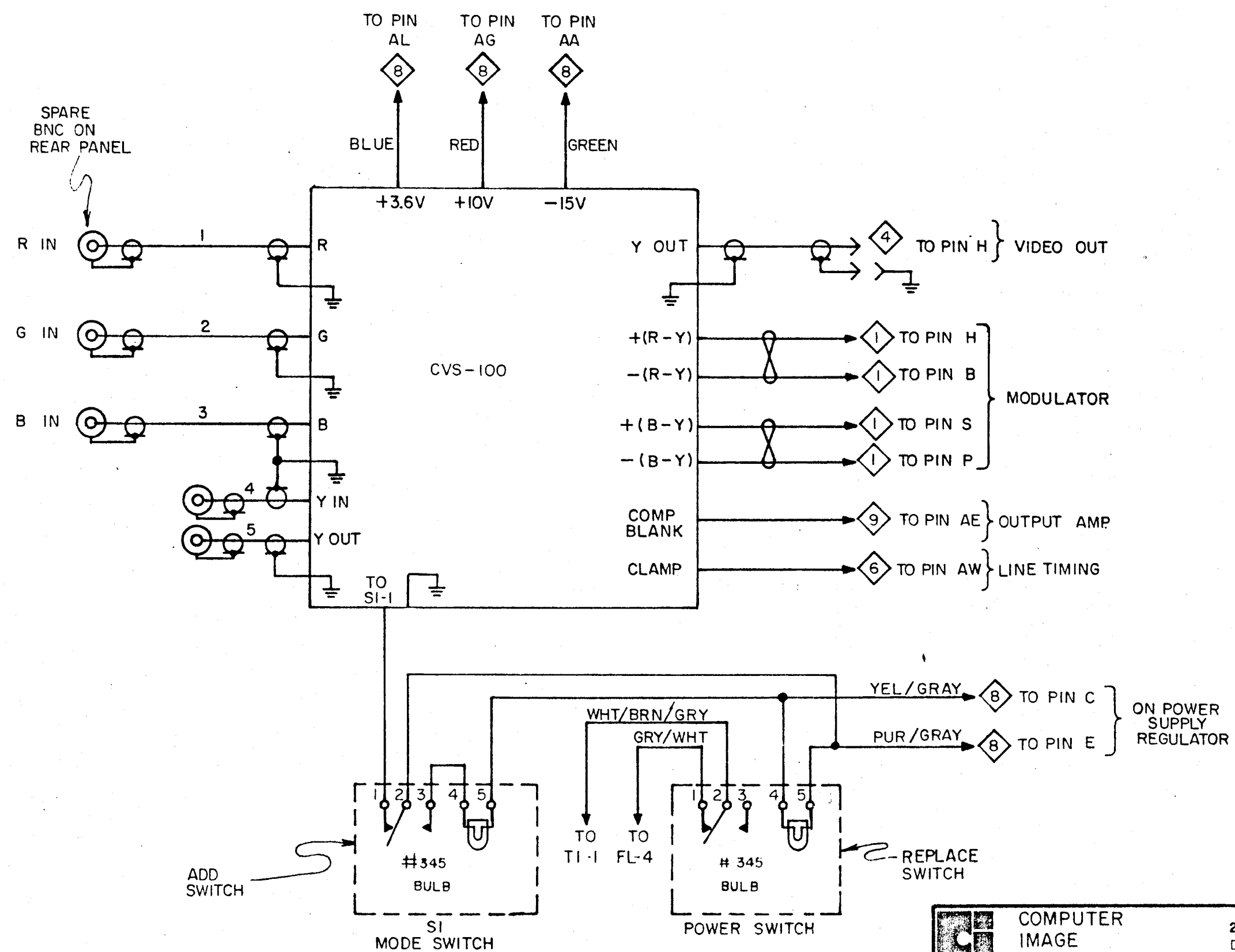
	COMPUTER IMAGE CORPORATION		2475 W. 2nd. AVE. DENVER, COLORADO 80223.	
	SCALE NONE	REVISION	BY	DATE
DATE 6-17-71				
DR'M E.R.	CR'D 88			
AP' VO. 88				
TITLE VOLTAGE COMPARATOR RASTER SEGMENT BLANKING			NO. 3	



		COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223	
SCALE	NONE	REVISION		BY	DATE
DATE	11-9-70				
DR'N	E.R.	CHK'D			
AP'VD					
SWITCH DRIVER ANIMATION CONTROLLER					AM-103A

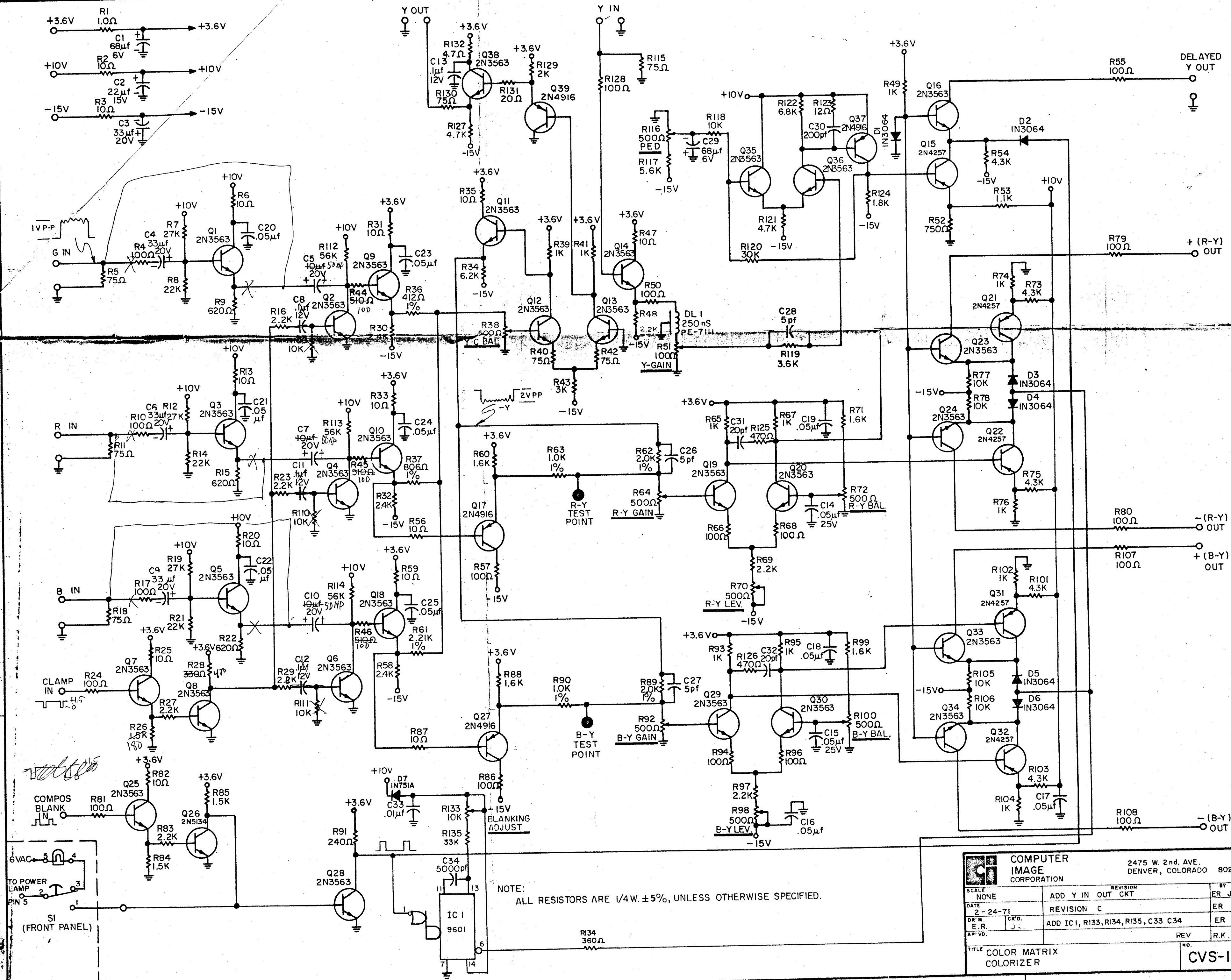


COMPUTER IMAGE			
ZONE			
1-17/73			
P.K.P.			
COLORIZER RACK AC-DC WIRING DIAGRAM		CVSW-100-2A	

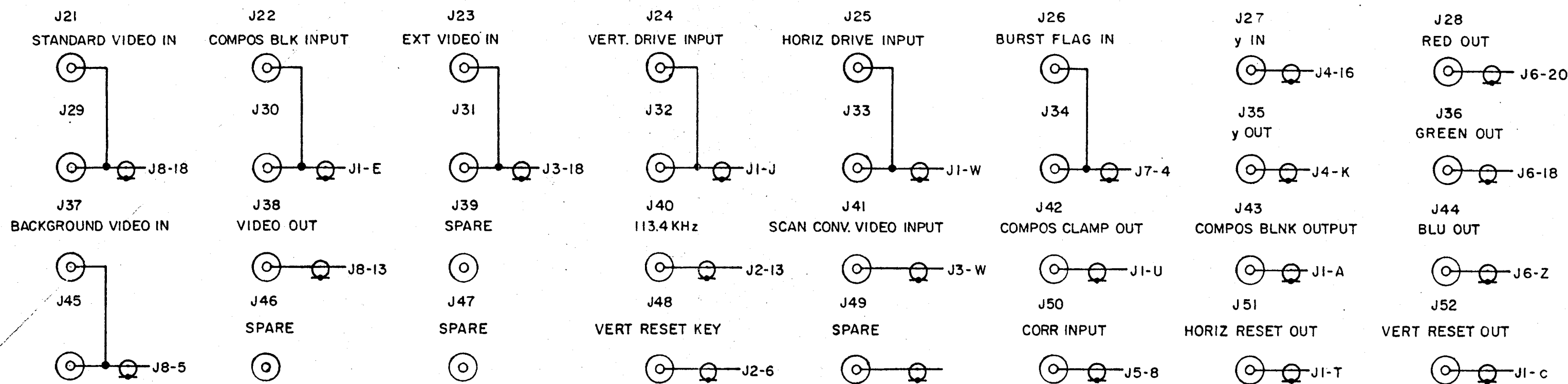


NOTE:
 SPLICE SPARE POWER SWITCH
 WIRES TOGETHER (F2 TO T1-4)
 T1-4 BLK/YEL/GRY
 F2 BLK/BRN/GRY

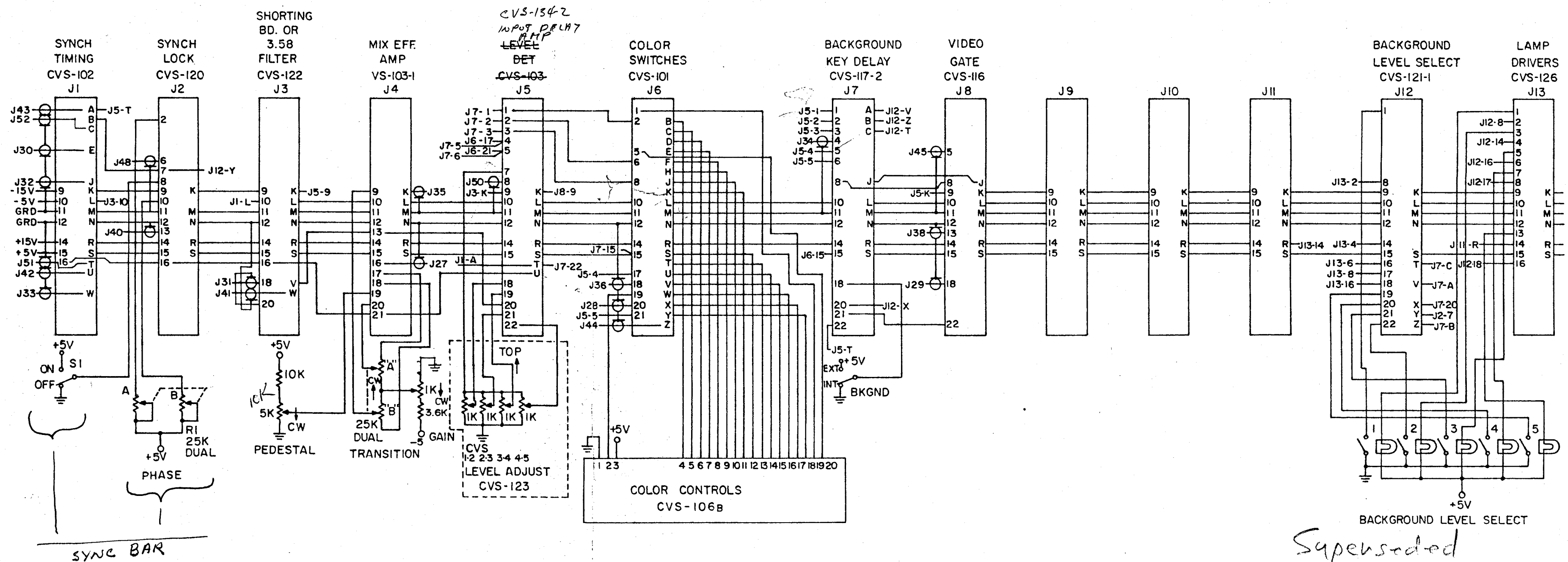
COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223	
SCALE	NONE	REVISION	BY
DATE	4-21-71	CK'D	DATE
DR'N	E.R.	AP'VD	
TITLE TEKTRONIX 140 NTSC SIGNAL GEN MODIFICATION WIRING DIAGRAM			NO. CVSW-104



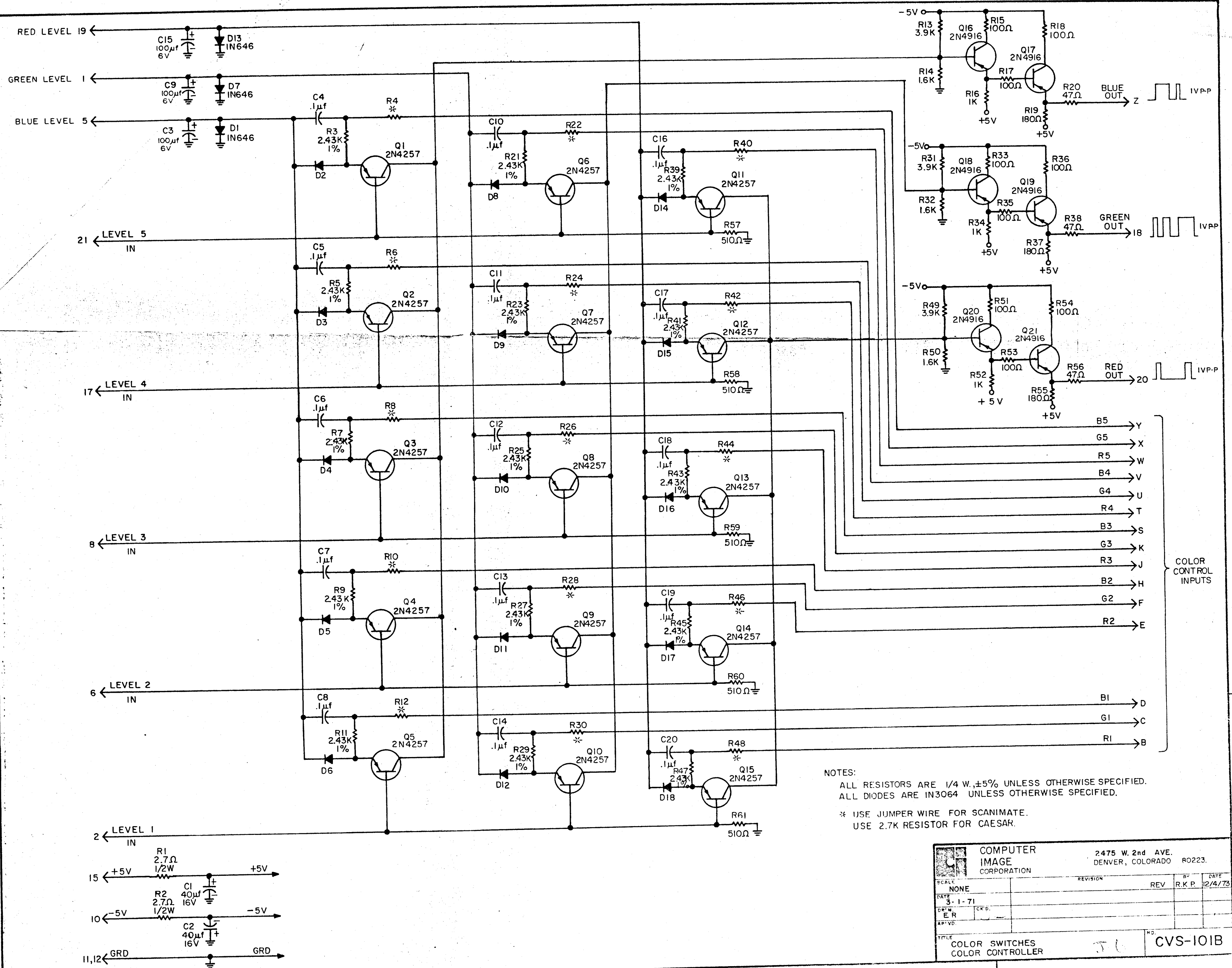
COMPUTER IMAGE CORPORATION		2475 W. 2nd. AVE. DENVER, COLORADO 80223.	
SCALE	REVISION	BY	DATE
NONE	ADD Y IN OUT CKT	ER JD	4-19-71
DATE	REVISION C	ER	10-14-71
2-24-71	ADD IC1, R133, R134, R135, C33 C34	ER	11-15-71
DR. W. E. R.	CK'D.	REV	R.K.P. 7-6-73
TITLE		NO.	
COLOR MATRIX COLORIZER		CVS-100-D	



REAR PANEL

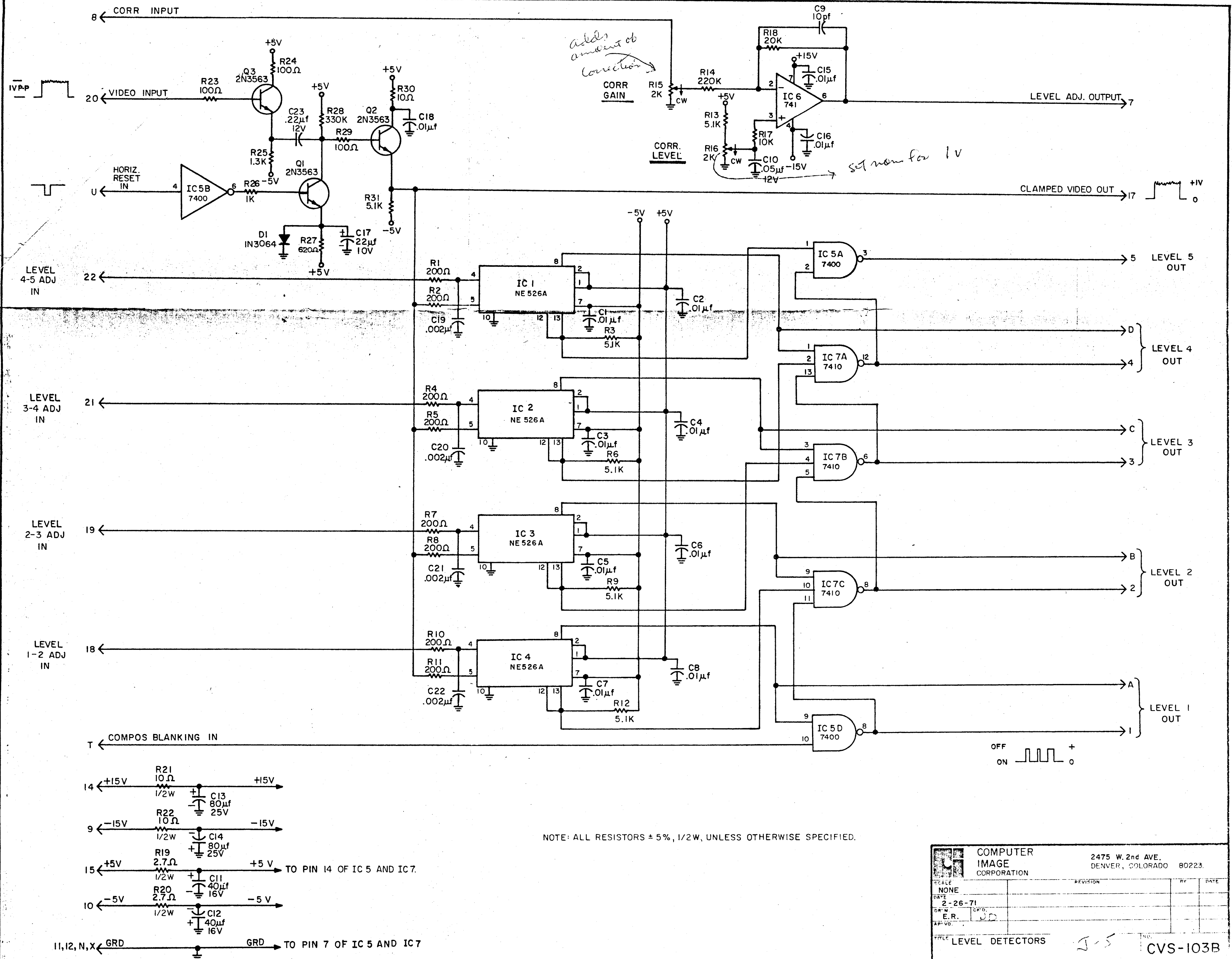


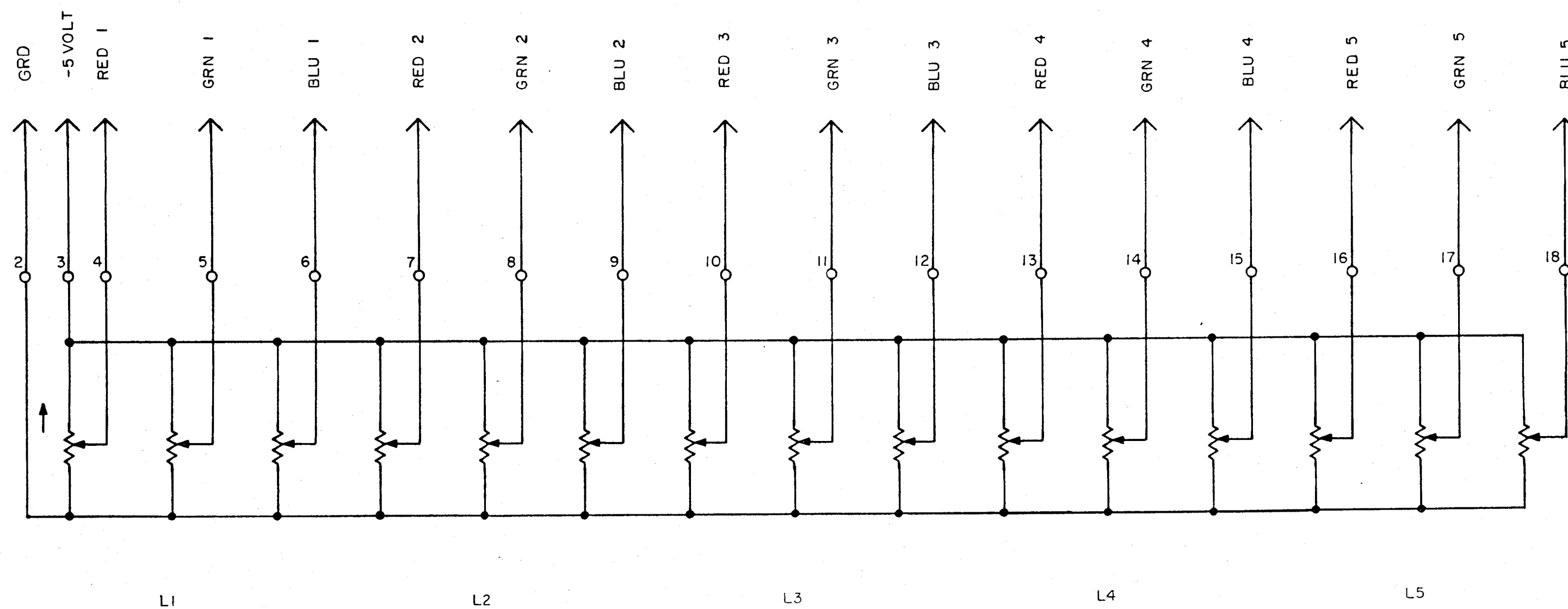
COMPUTER IMAGE CORPORATION		2162 SOUTH JASON STREET, DENVER, COLORADO 80223.	
SCALE	NONE	REVISION	REV
DATE	10-21-72	BY	R.K.P.
DR. M. MACK	CKD.	OLD DWG	
TITLE		NO.	
WIRING DIAGRAM		CVSW-101-3	
COLOR CONTROLLER			



NOTES:
ALL RESISTORS ARE 1/4 W., ±5% UNLESS OTHERWISE SPECIFIED.
ALL DIODES ARE IN3064 UNLESS OTHERWISE SPECIFIED.
* USE JUMPER WIRE FOR SCANIMATE.
USE 2.7K RESISTOR FOR CAESAR.

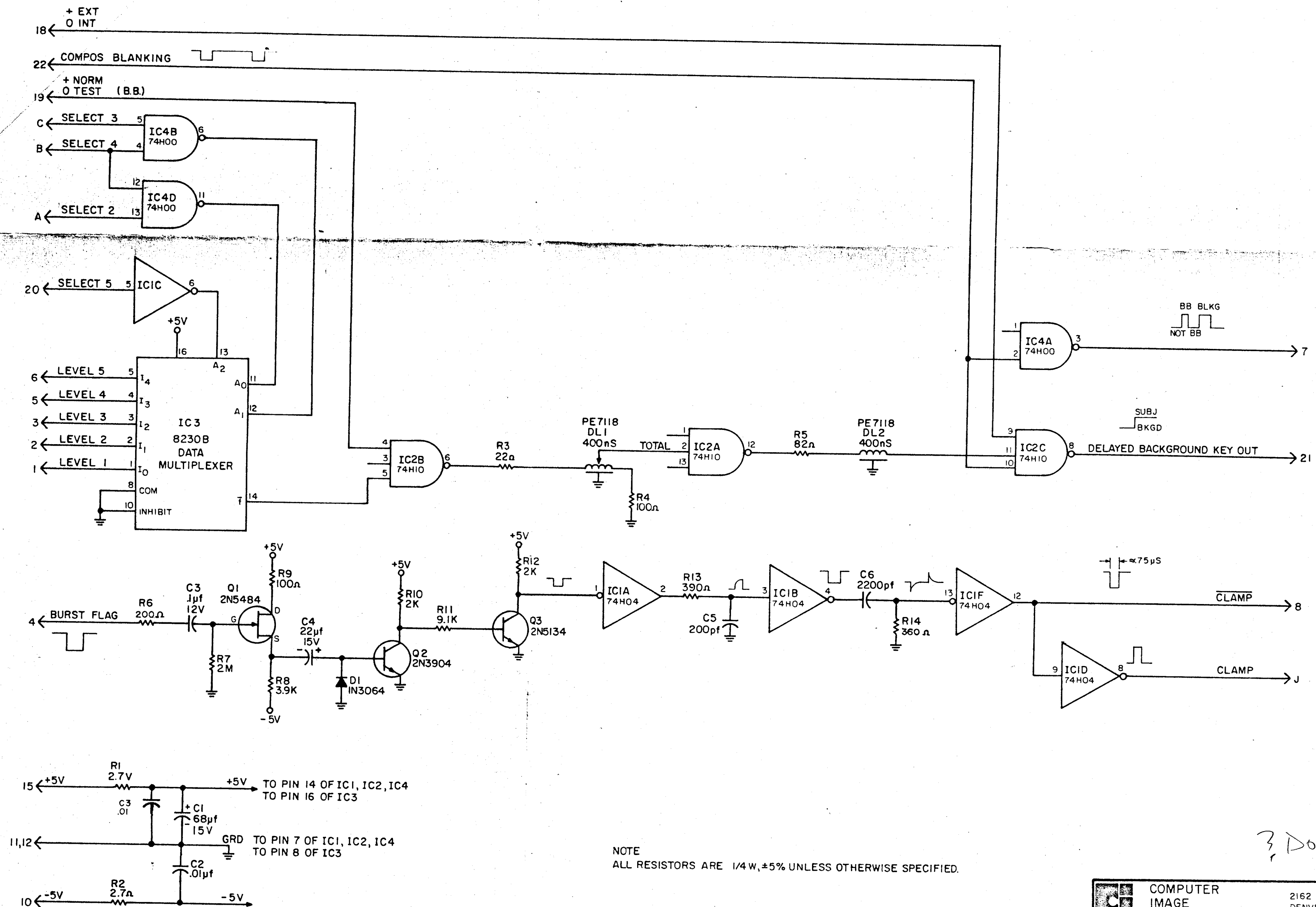
COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80223.	
SCALE NONE	REVISION	REV	R.K.P.
DATE 3-1-71	CKD.		DATE 12/4/73
DRW E.R.	AP'D		
TITLE COLOR SWITCHES COLOR CONTROLLER		NO. CVS-101B	





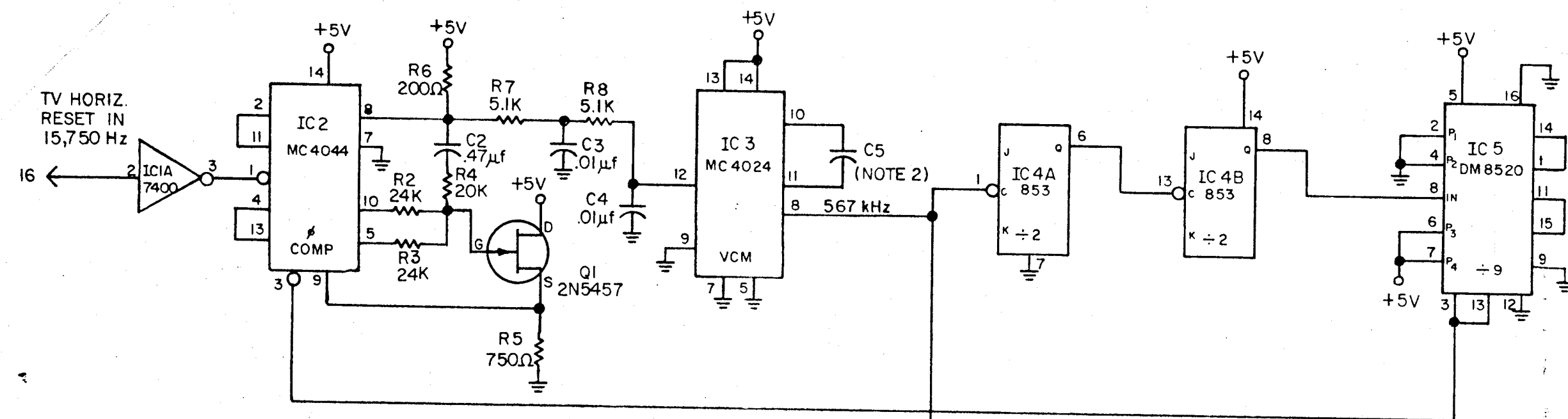
ALL POTS 1K LINEAR CTS-480

COMPUTER IMAGE CORPORATION		2475 W. 2nd. AVE. DENVER, COLORADO 80223	
SCALE NONE	REVISION REV.	BY R.K.P.	DATE 11/16/71
DATE 3-11-71	DRAWN E.R.	CHECKED J.C.	NO.
TITLE COLOR CONTROLS COLOR CONTROLLER			NO. CVS-106B

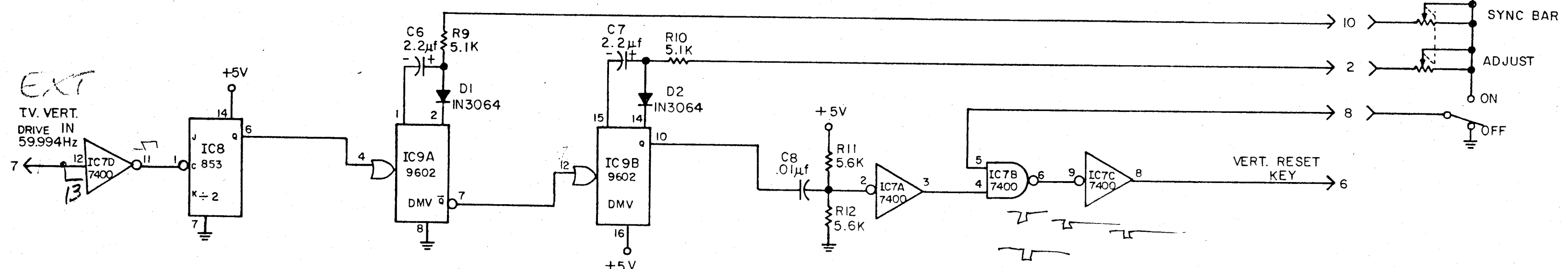
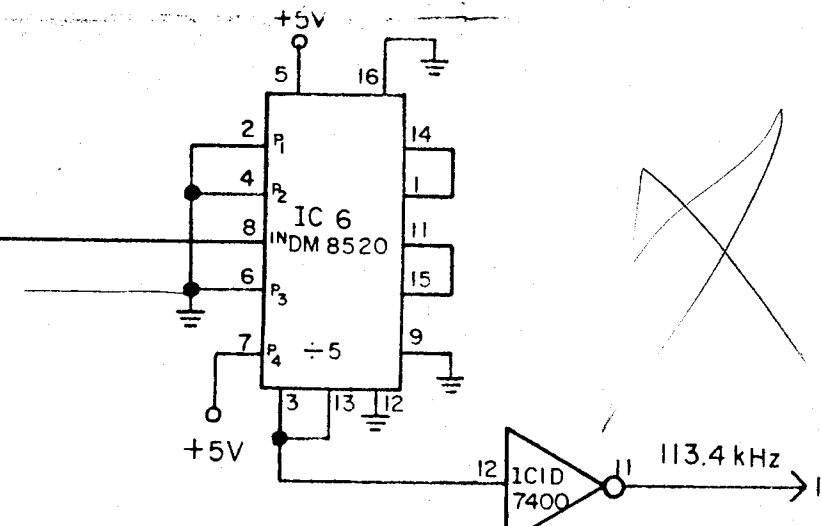
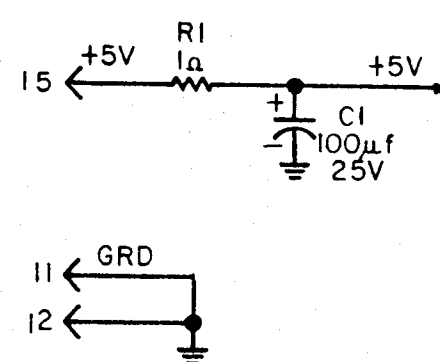


3 Don't have

		COMPUTER IMAGE CORPORATION		2162 SOUTH JASON STREET, DENVER, COLORADO 80223	
SCALE	NONE	REVISION		BY	DATE
DATE	9-23-72				
DR'N	MACK	CHK'D			
AP'VD					
TITLE					NO.
BACKGROUND KEY DELAY					CVS-117-2
COLOR CONTROLLER					



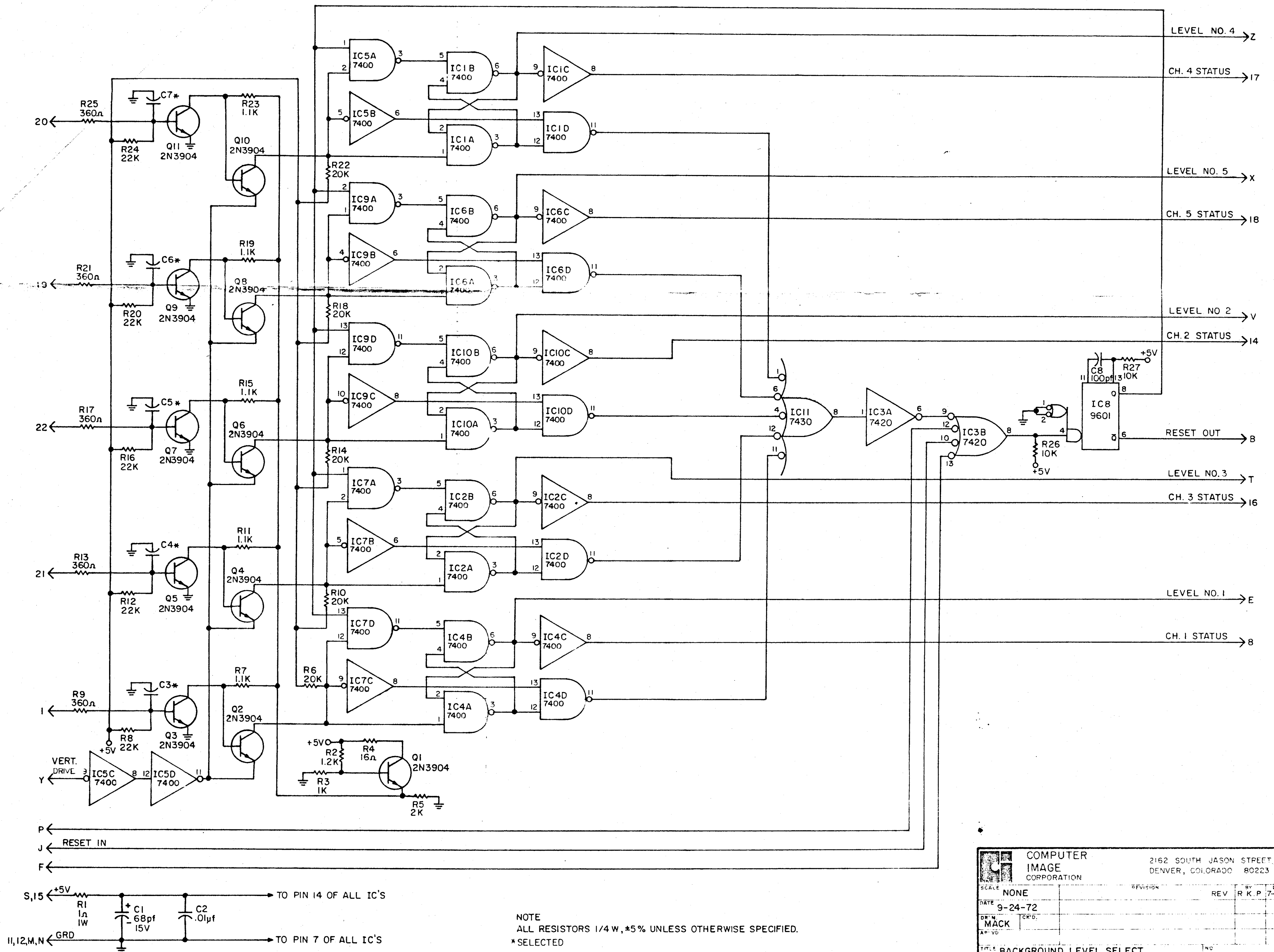
*Superceded
see WEA sheets*



*VERT
RESET*

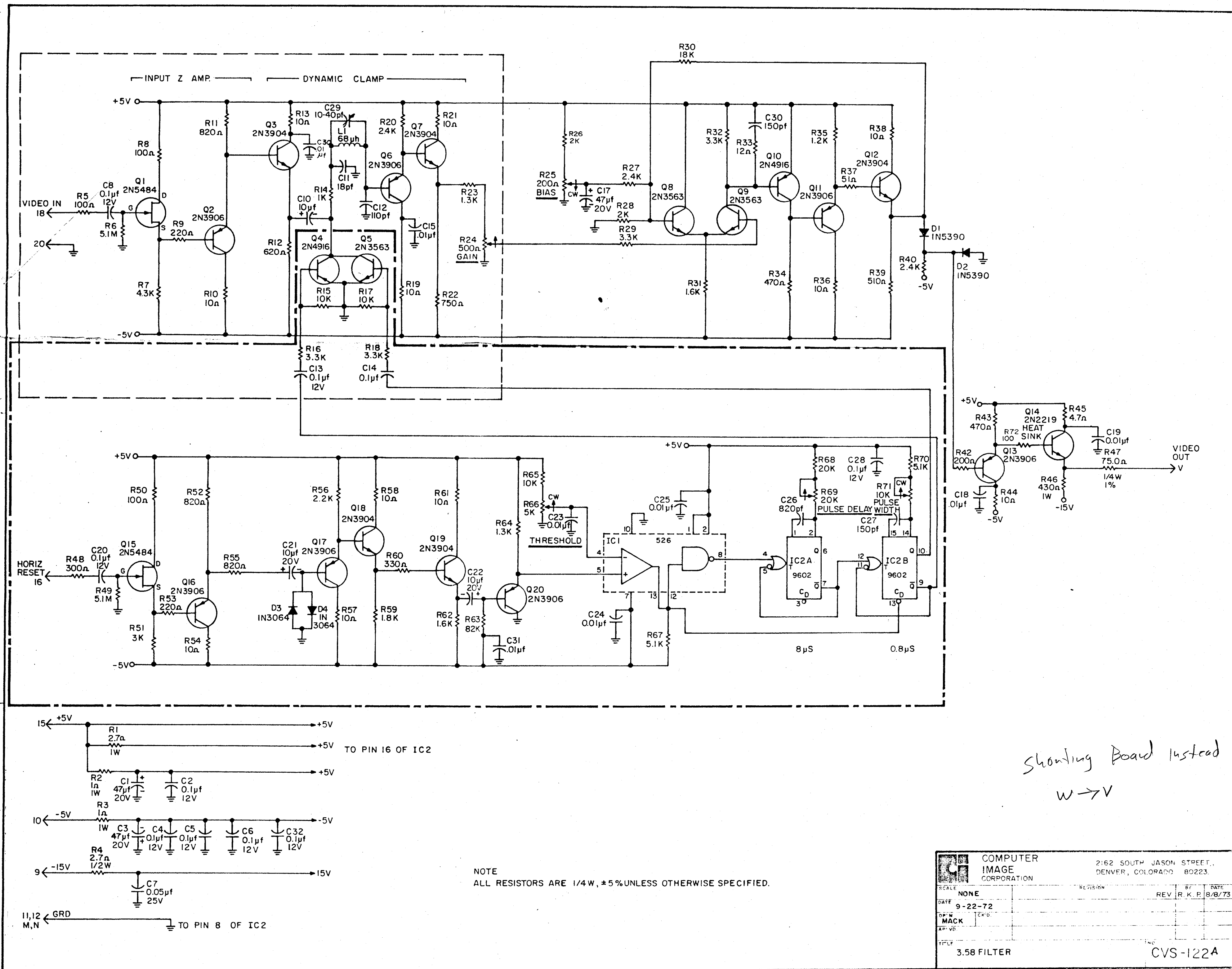
NOTE 1. ALL RESISTORS $\pm 5\%$, 1/4 W UNLESS OTHERWISE SPECIFIED
2. SELECT VALUE OF C5 FOR 3.6V AT PIN 12 OF IC3

		COMPUTER IMAGE CORPORATION		2475 W. 2nd AVE. DENVER, COLORADO 80222	
SCALE	NONE	REVISION	REV	R K P	DATE
DATE	2-28-72				
DRN	E.R.				
APVD					
TITLE			SYNC LOCK		
			CVS-120		

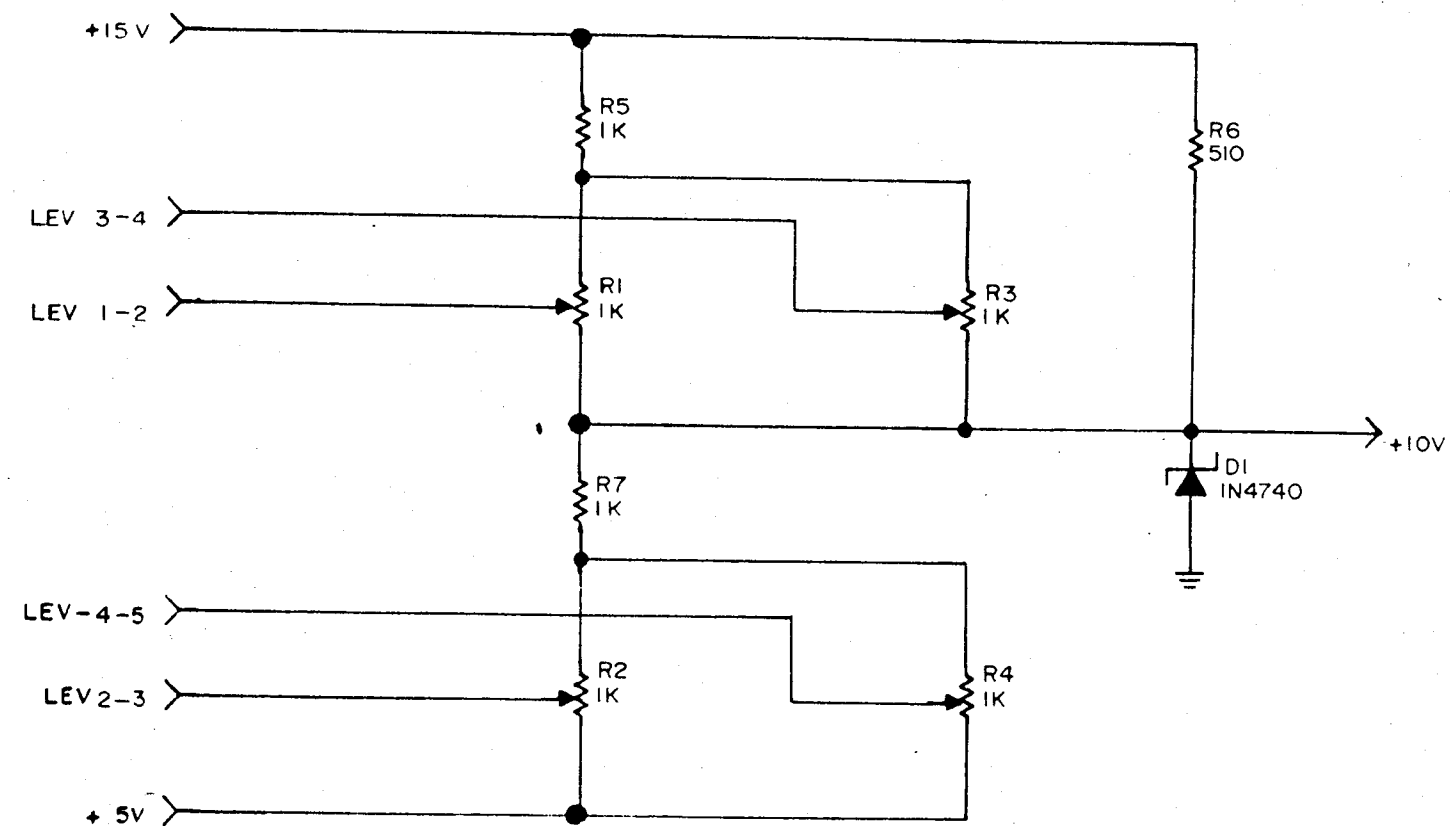


NOTE
ALL RESISTORS 1/4 W, *5% UNLESS OTHERWISE SPECIFIED.
* SELECTED

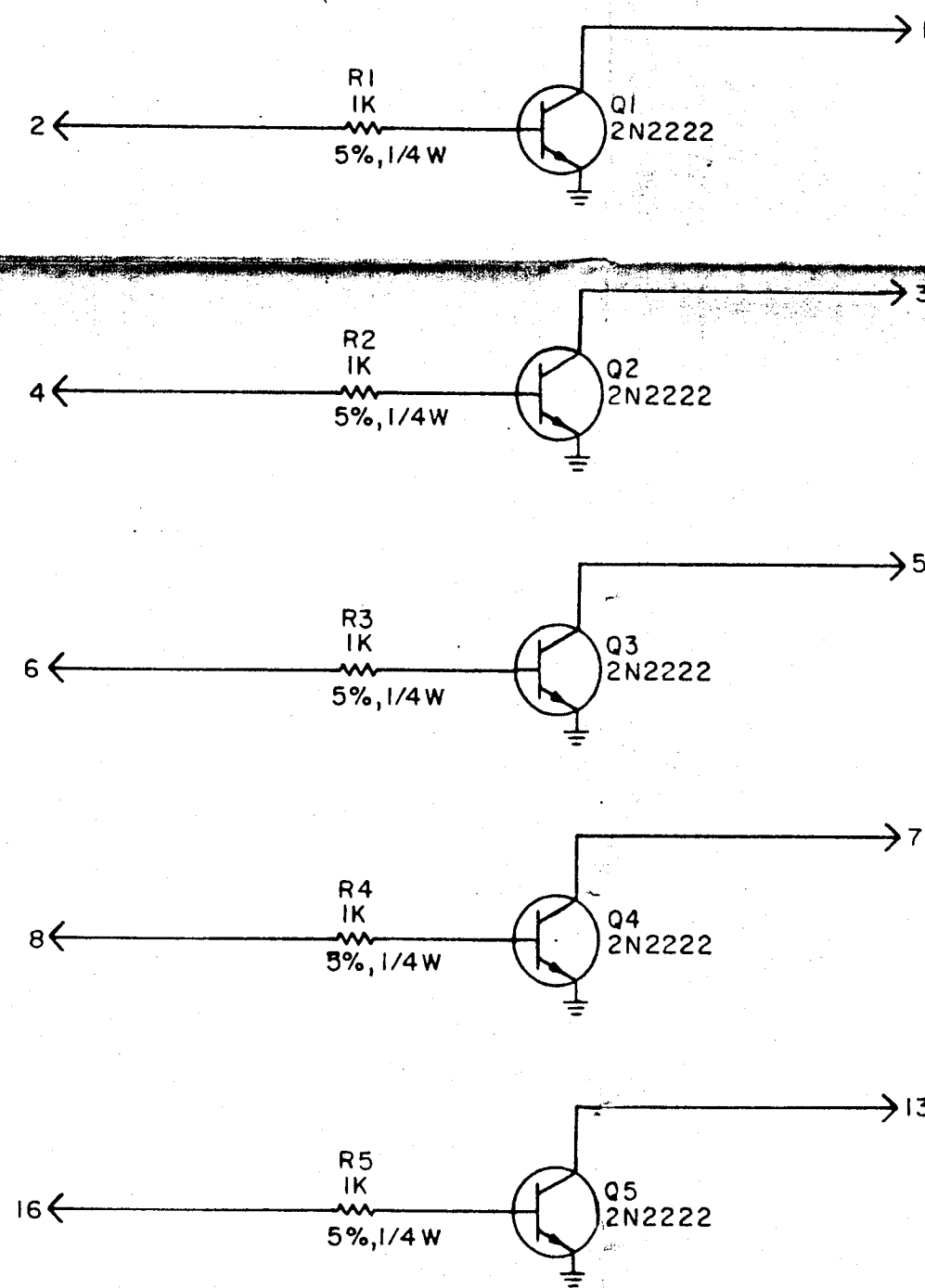
COMPUTER IMAGE CORPORATION		2162 SOUTH JASON STREET, DENVER, COLORADO 80223	
SCALE NONE	REVISION	REV	DATE 9-24-72
DATE 9-24-72	DRN MACK	CHK'D	
TITLE BACKGROUND LEVEL SELECT		NO CVS-121-1	



showing Board instead
W → V

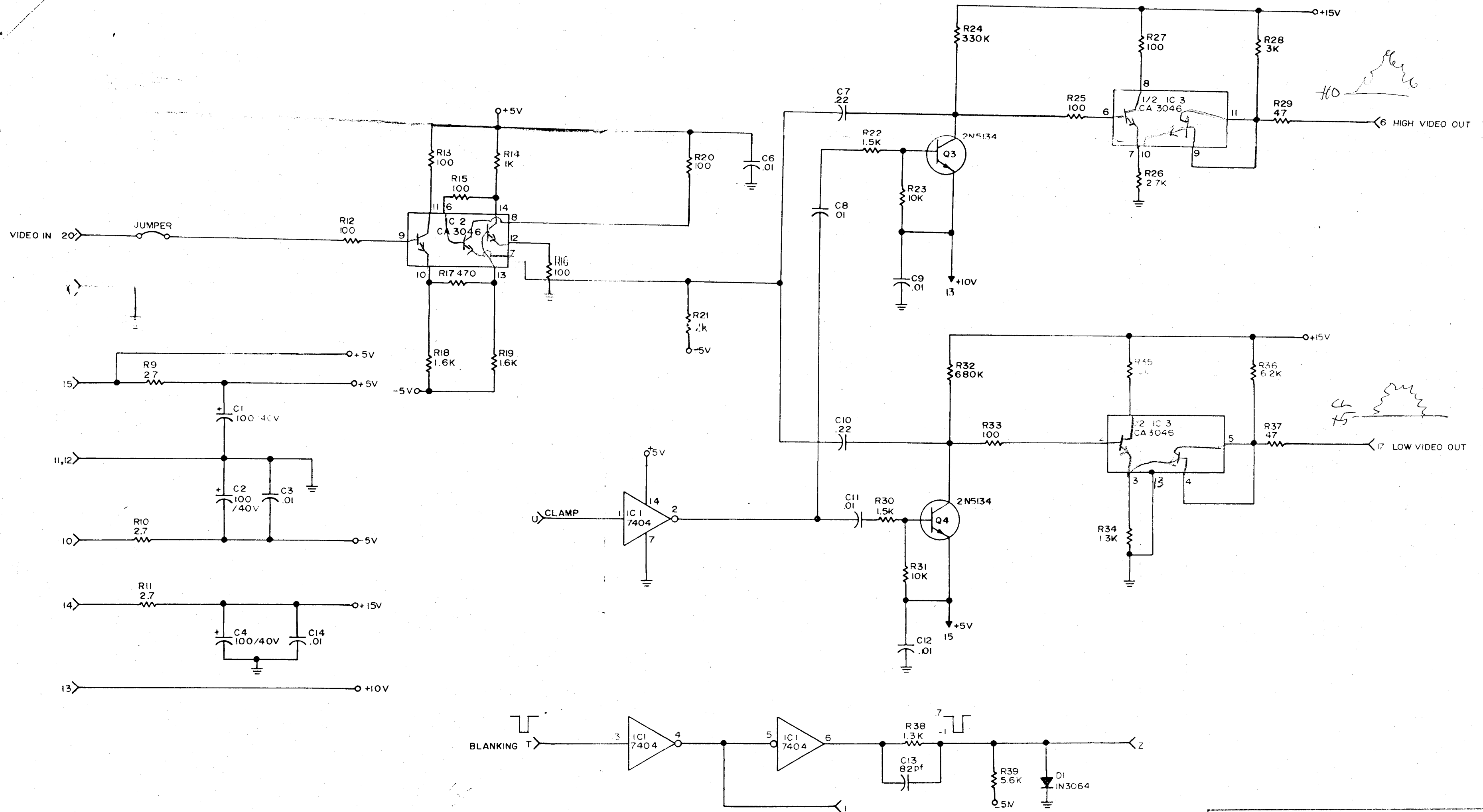


	COMPUTER IMAGE CORPORATION	2475 W 2nd AVE DENVER, COLORADO 80223		
NONE		REV-A	R.K.P.	12/6/73
9/25/72		REV	RK P	12/26/73
MACK				
LEVEL ADJUST		CVS-123A		



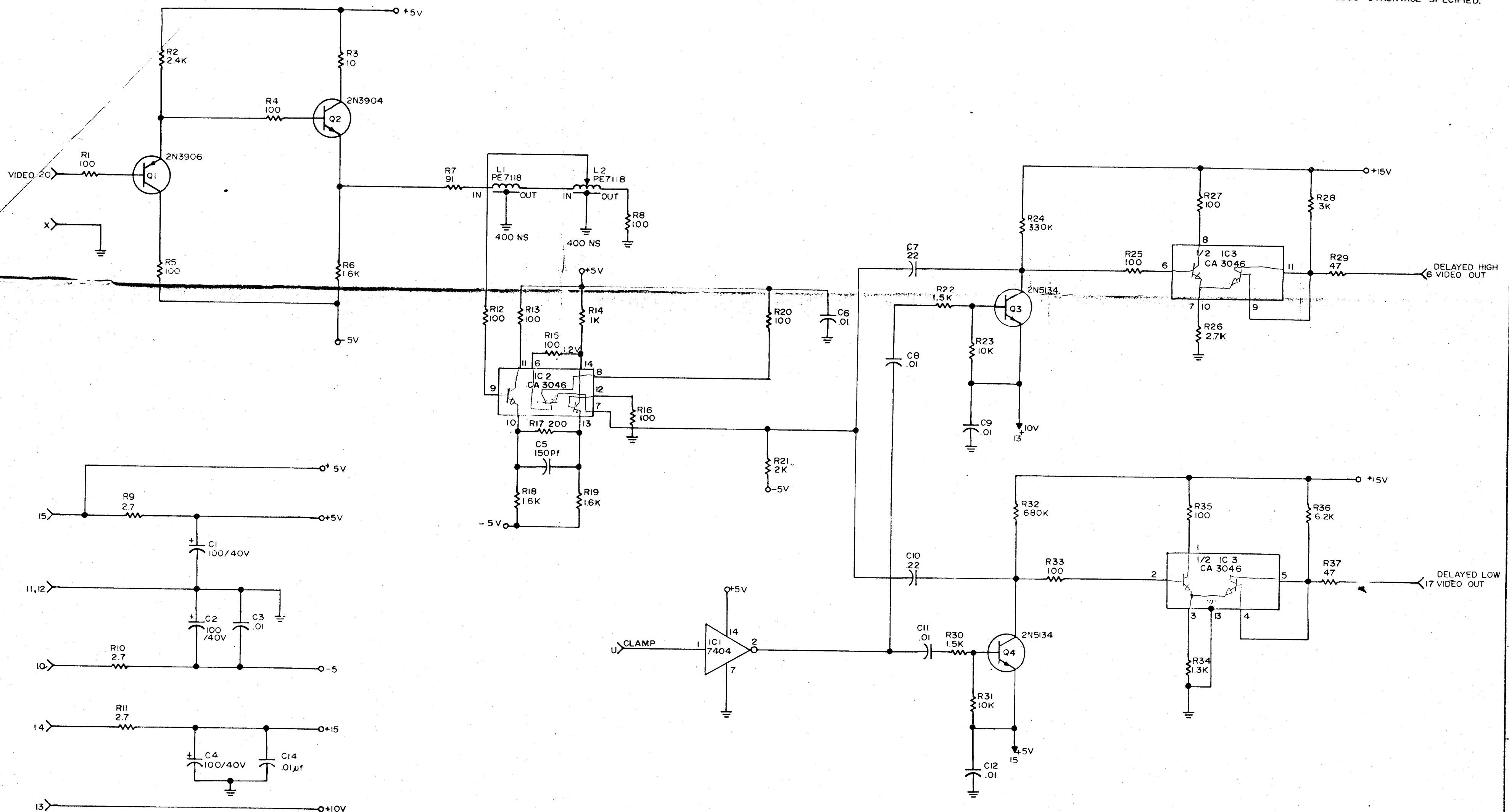
 COMPUTER IMAGE CORPORATION		2162 SOUTH JASON STREET, DENVER, COLORADO 80223	
SCALE	NONE	REVISION	BY
DATE	9-25-72	DATE	
DR	MACK	DATE	
AP	VP	DATE	
TITLE		NO.	
LAMP DRIVER		CVS-126	

ALL RESISTORS ARE 1/4 W $\pm 5\%$ UNLESS OTHERWISE SPECIFIED

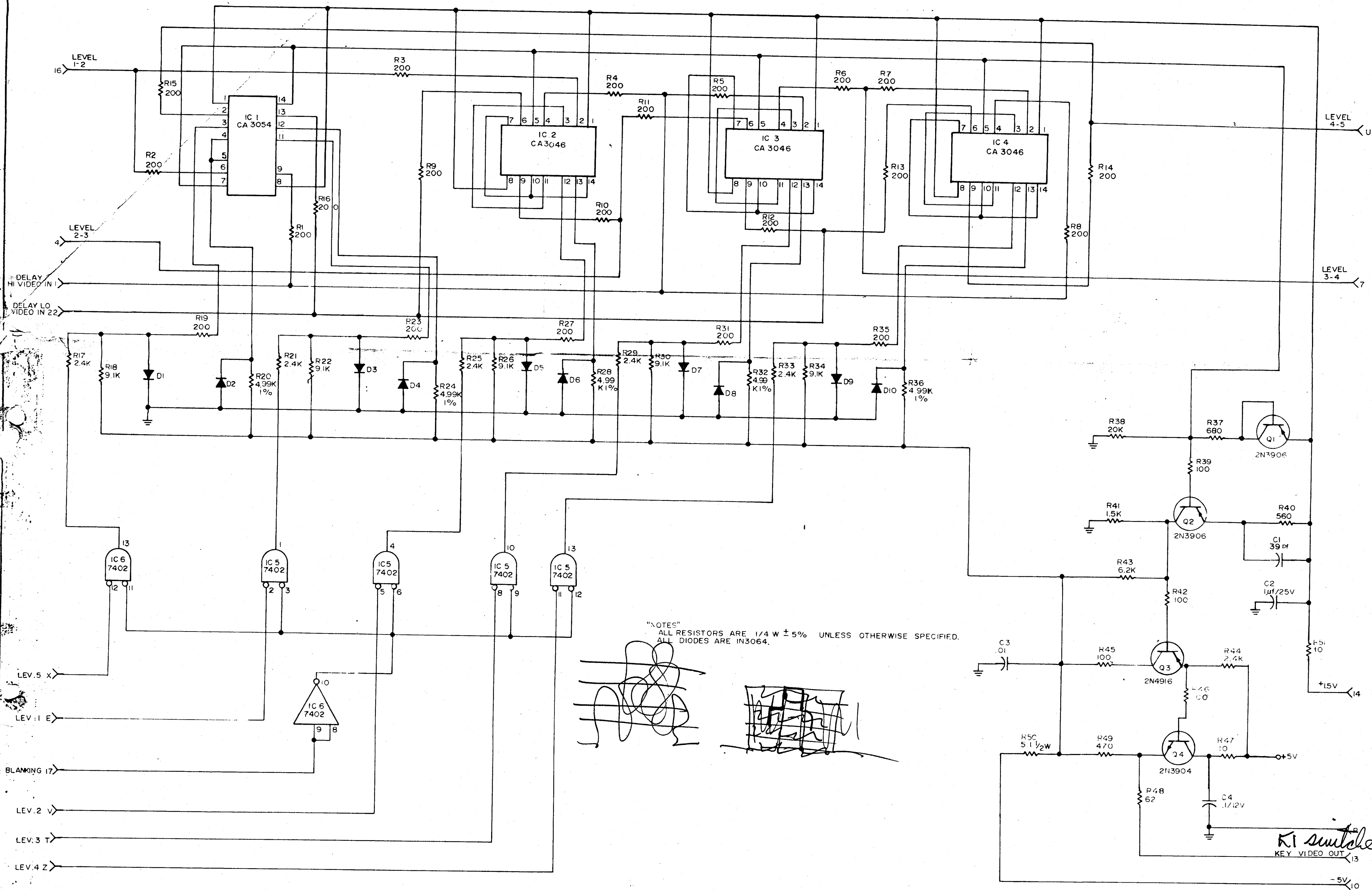


COMPUTER IMAGE	
NONE	
11/1/73	
R K P	
INPUT AMP	CVS-134-2

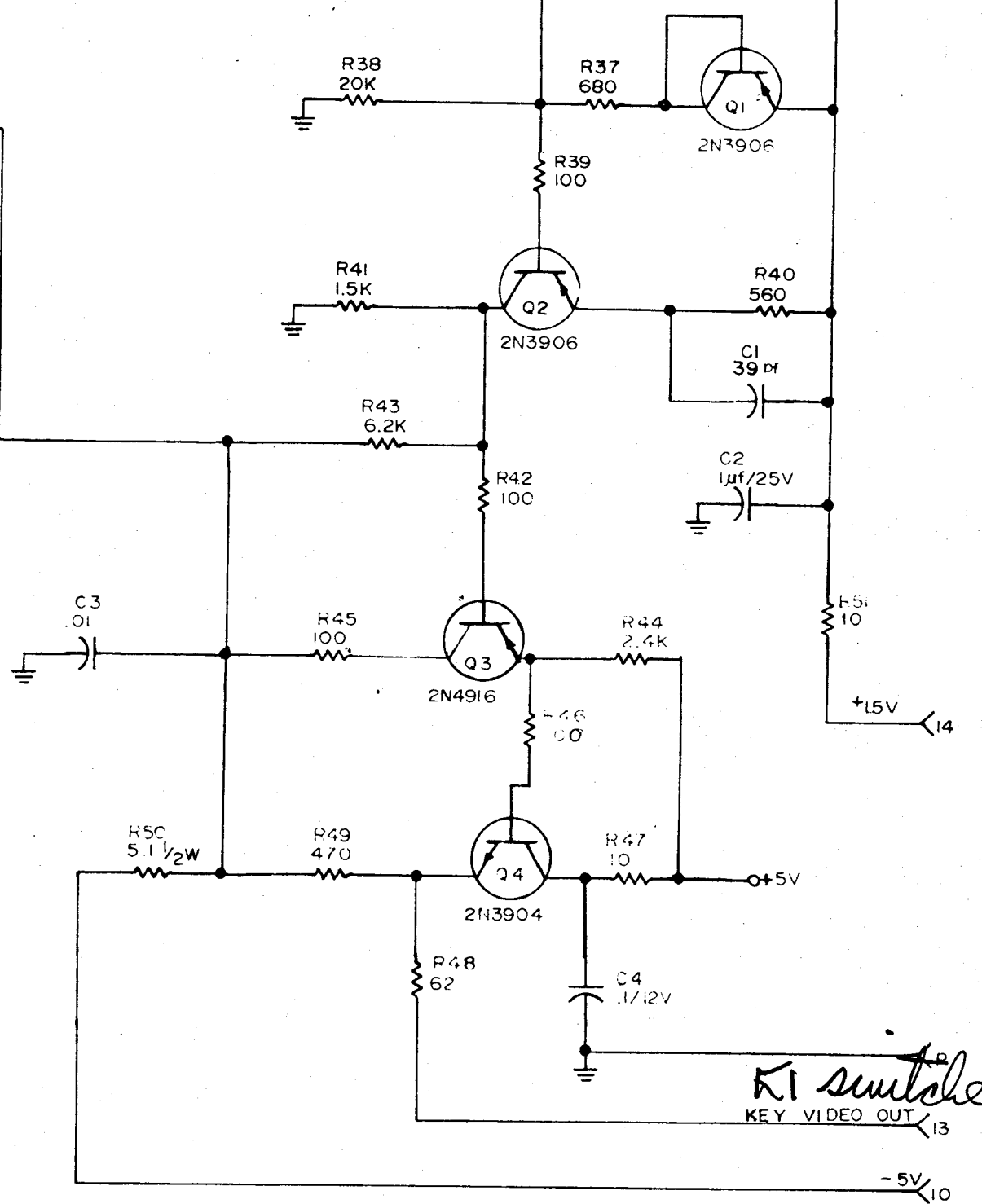
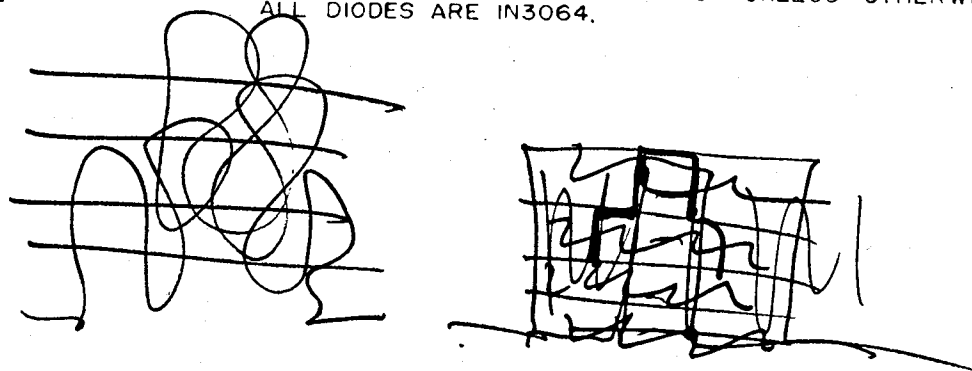
"NOTES"
ALL RESISTORS ARE 1/4 W $\pm 5\%$ UNLESS OTHERWISE SPECIFIED.



COMPUTER IMAGE			
NONE			
11/1/73			
R. K. P.			
DELAY AMP		J9 CVS-134-I	

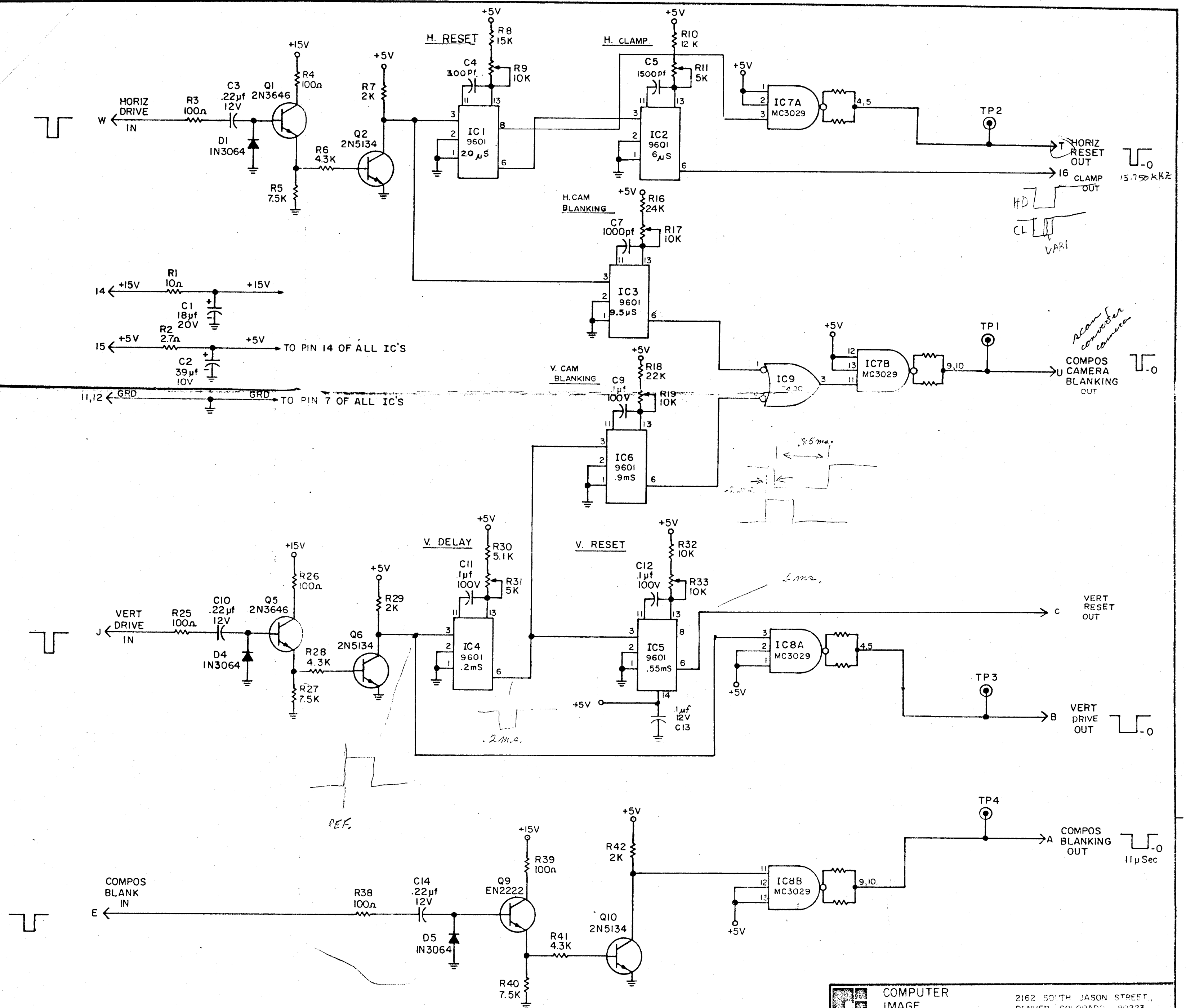


"NOTES"
ALL RESISTORS ARE 1/4 W $\pm$ 5% UNLESS OTHERWISE SPECIFIED.
ALL DIODES ARE 1N3064.



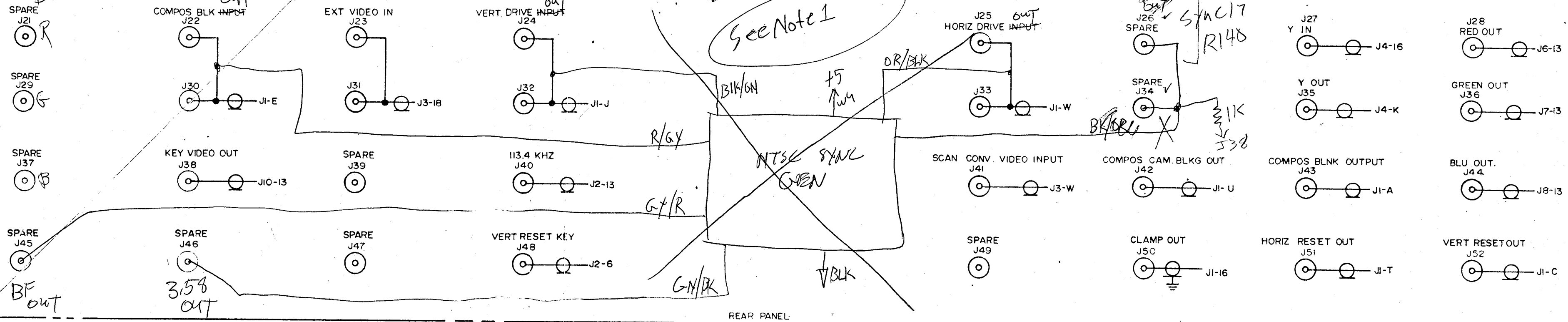
COMPUTER IMAGE	
NONE	
11/10/73	
R.K.P.	
BACKGROUND COMPARATORS	

CVS-135
J10

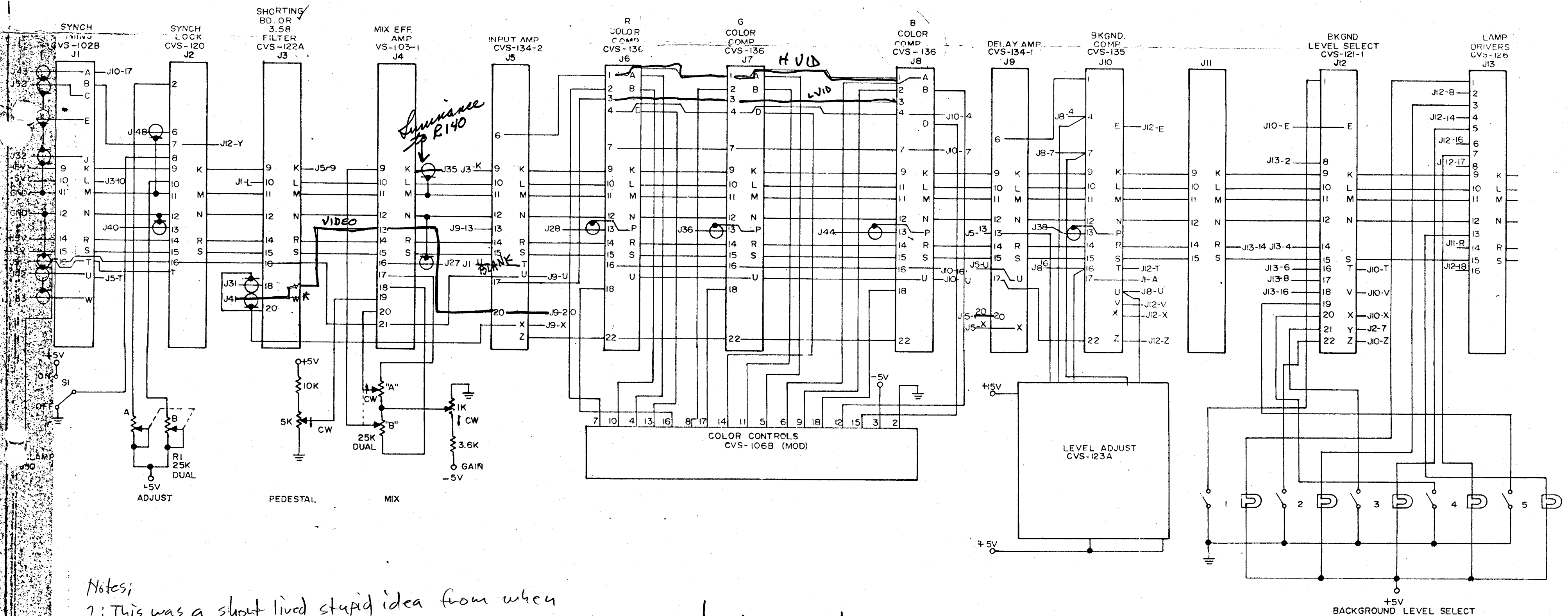


		COMPUTER IMAGE CORPORATION		2162 SOUTH JASON STREET, DENVER, COLORADO 80223	
SCALE	NONE	REVISION	REDRAW WITH CHANGES	BY	DATE
DATE	2-26-71			Mack	9-12-72
DRN	E.R.	CRD			
APR	VD				
TITLE					NO
SYNC TIMING COLOR CONTROL					CVS-102C 11

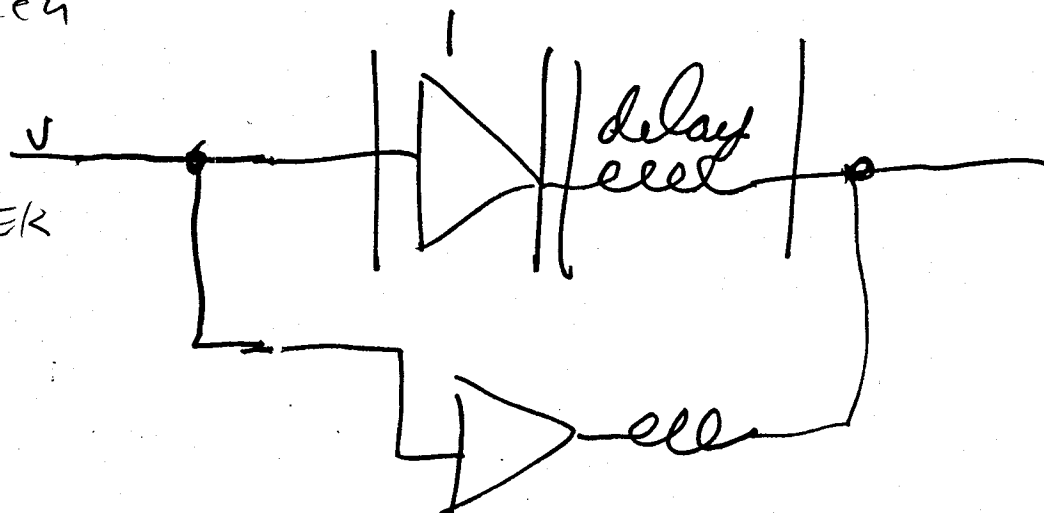
Ext BG



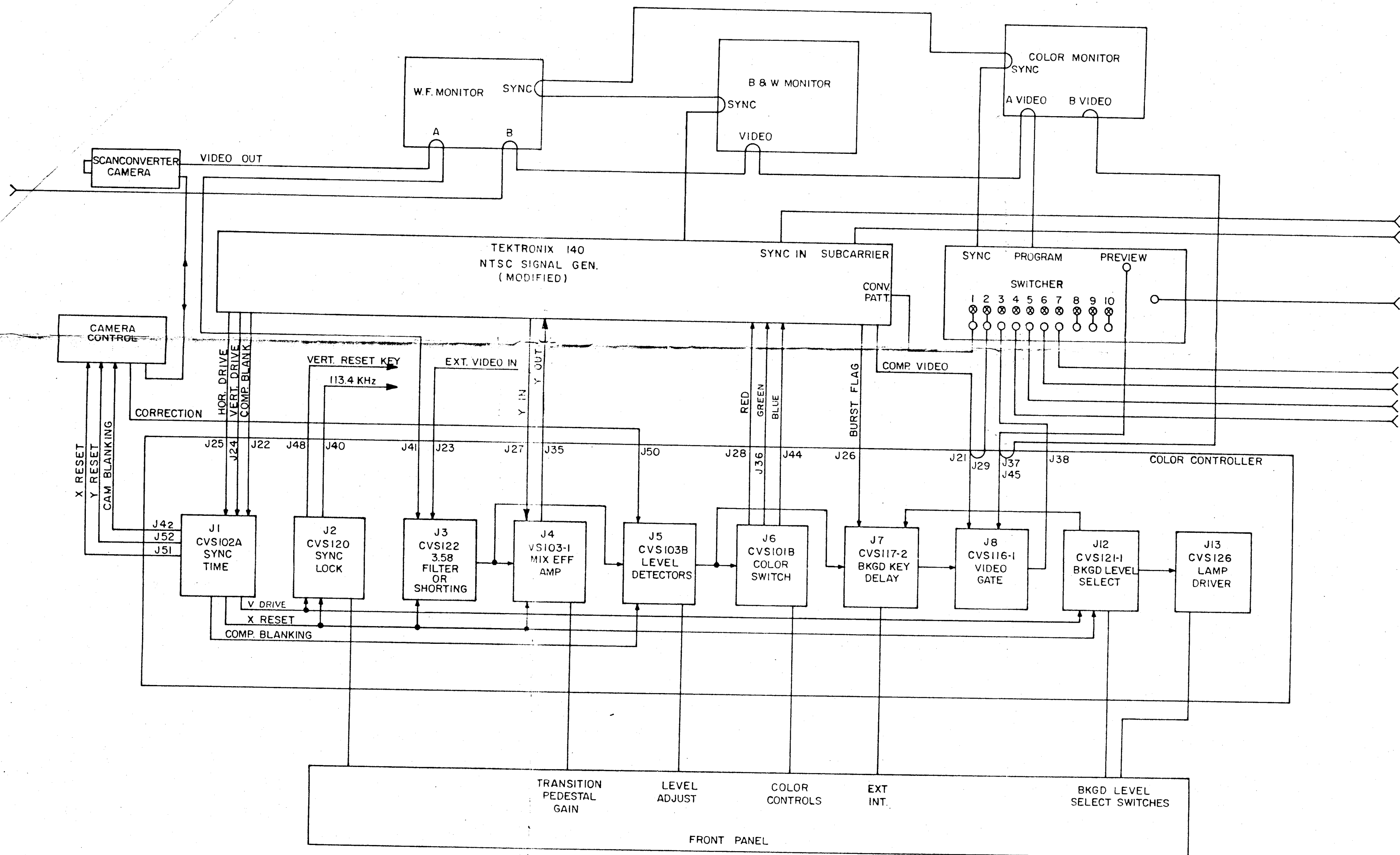
REAR PANEL

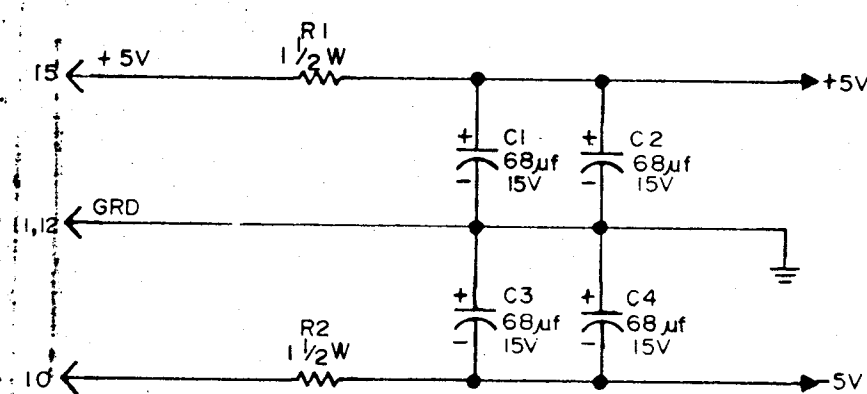
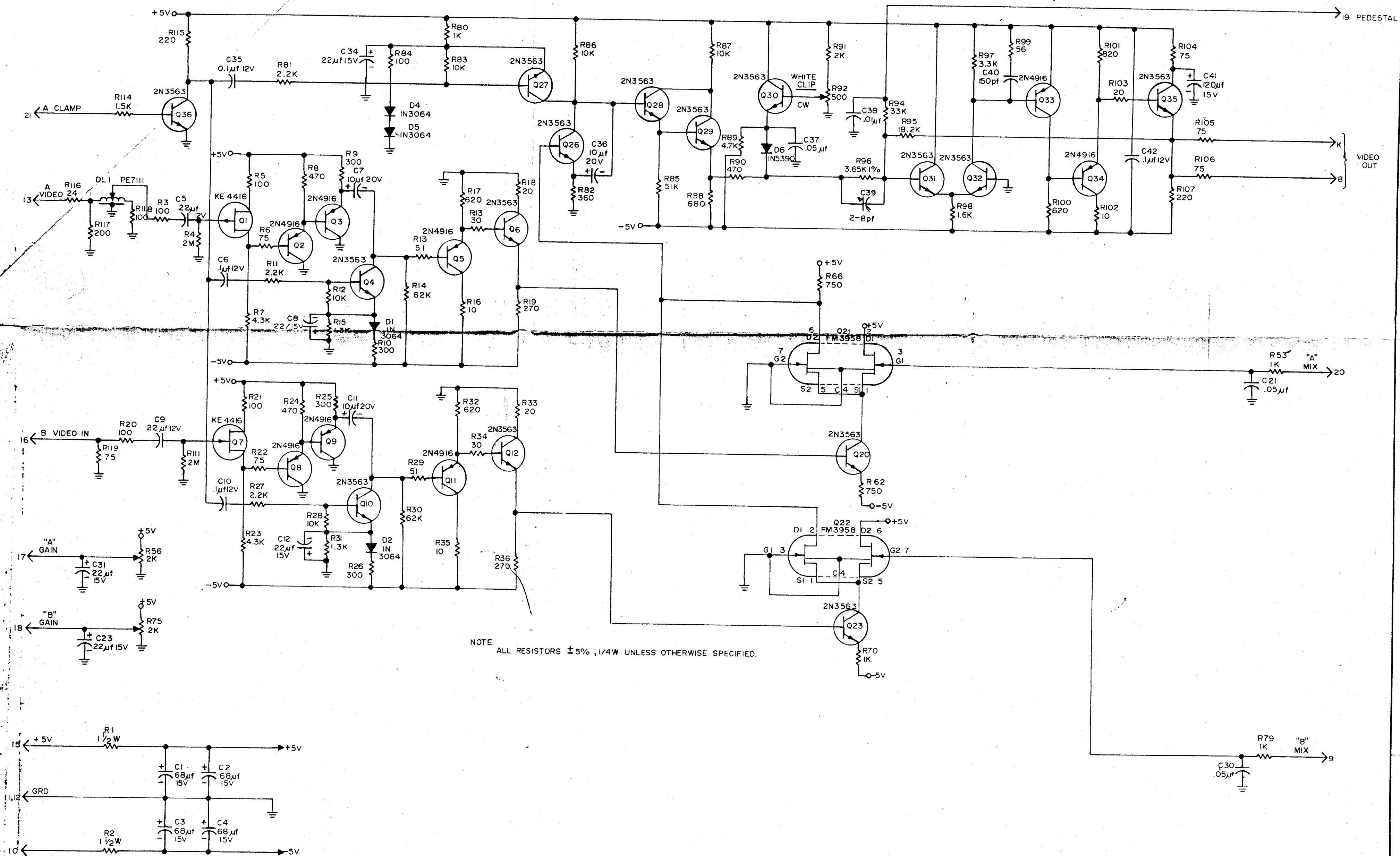


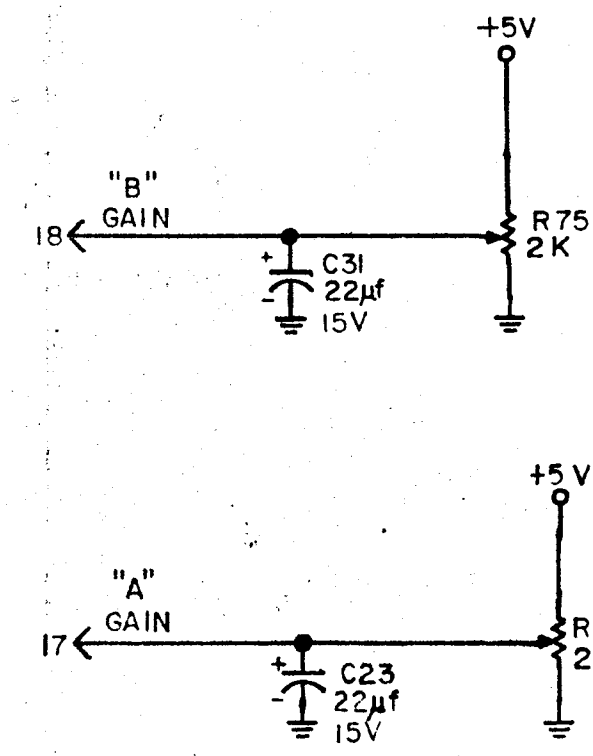
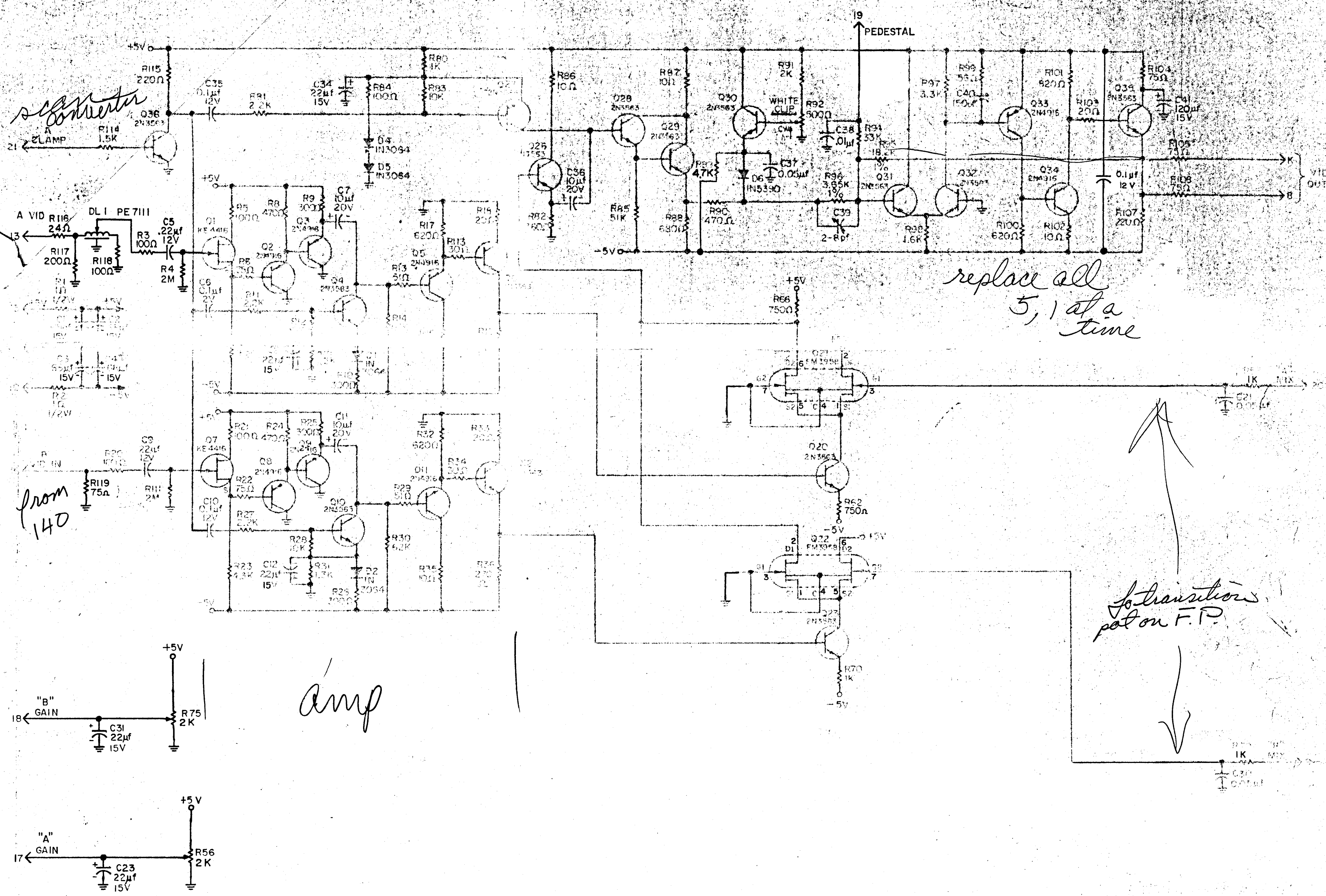
Notes:
 2: This was a short lived stupid idea from when I didn't have an NTSC Sync Generator. It was a card from a cable automation thingy from Ole Miss thanks to ED MEEK



 COMPUTER IMAGE CORPORATION 2475 W. 2nd AVE. DENVER, COLORADO 80223	
NONE 12/13/73 R. K. P.	
WIRING DIAGRAM COLOR CONTROLLER	
CVSW-101-5	







NOTE: ALL RESISTORS $\pm 5\%$, 1/4 W, UNLESS OTHERWISE SPECIFIED.

11-29-V MIX-EEF AMPLIFIER COLOR CONTROLLER	REV R.K.P. 7.5.73 VS-103A J4
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